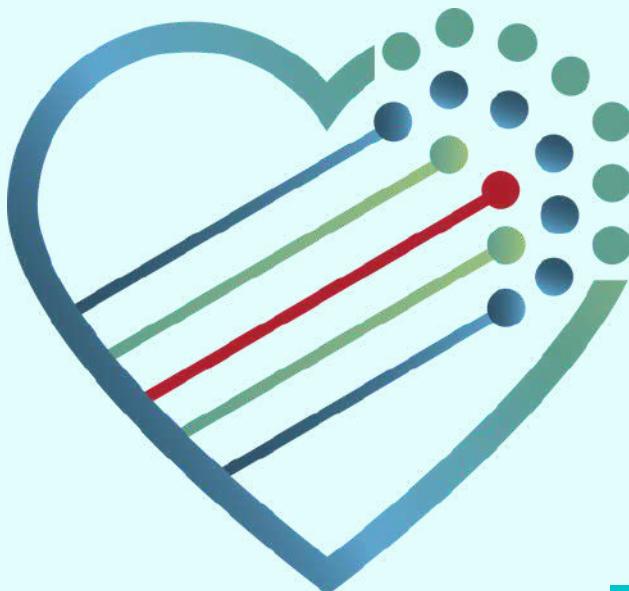


PHAST-NEWS



WORK PACKAGE 2 PHAST-ETN project

By the PHAT-ETN Team

Dear reader, welcome back to PHAST NEWS!

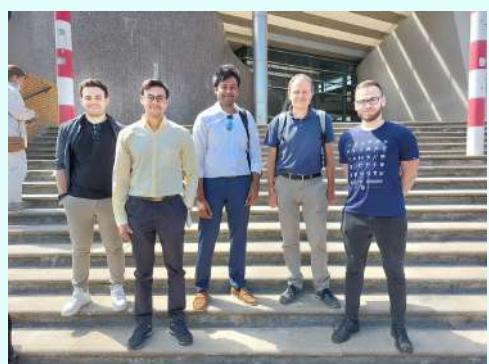
In this issue we present the activities of **Work Package 2 team**, focused on '**Tissue diagnostics and functional monitoring**'.

WHO IS INVOLVED?

Malhar Nagar (ESR 4), **Faruk Beslija** (ESR 5) and **Sri Vamshi Krishna Damagatla** (ESR 6).

WHAT DO THEY DO?

- Malhar is developing *integrated optical fibre sensors for intravital monitoring* in collaboration with Philips Healthcare
- Faruk's work deals with *hybrid diffuse optical monitoring and theranostics with blood flow and oxygen metabolism biomarkers on pre-clinical models*
- Vamshi's activity is focused on *time-gated diffuse optical spectroscopy for deep tissue diagnostics*.



WP 2 ESR fellows together with some of their Supervisors:
Marco Lai (PHILIPS), **Malhar Nagar**,
Sri Vamshi Krishna Damagatla,
Antonio Pifferi (POLIMI), **Faruk Beslija**.

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MEET PROF. ANTONIO PIFFERI

EUROPEAN RESEARCHERS' NIGHT



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WP2 ESR FELLOWS

Malhar Nagar

I hail from Porbandar, Gujarat, which is the westernmost region of India, famous for Mahatma Gandhi's birthplace. I completed my Bachelor of Science (Honours) and Master of Science in **Physics** from Sri Sathya Sai Institute of Higher Learning, Puttaparthi, India in 2018 and 2020 respectively.

Always been **intrigued by fiber optics and ultrafast non-linear optics**, I decided to carry out my master's thesis on Time-Resolved Third Order Nonlinear Optical Susceptibility Measurements Using Femtosecond Degenerate Four-Wave Mixing: Automation and Analysis. Further, I also underwent a **special training program** on practical aspects of handling optical fibers and familiarising fiber optic components.

I have always been **fascinated by optical fibers' versatility in a variety of applications**, from sensing to telecommunications, and I always had this desire to apply them in practical settings. This exceptional chance to use optical fiber sensing for bio-medical applications was made available to me by PHAST. This inspired me to carry out my Ph.D. in "Integrated optical fiber sensors for intravital monitoring" at Politecnico di Torino, Italy.



Faruk Beslija

I received my BSc and MSc in **Electrical and Electronics Engineering** from the International University of Sarajevo, Bosnia and Herzegovina, in 2018 and 2019, respectively. Though I had an interest in combining my engineering background with medical applications before, it was during my masters when I entered the world of biomedical optics. I spent a year as a researcher in the field of optics-based small particle detection for medical diagnostics. In October 2020, I joined the Medical Optics group at The Institute of Photonic Sciences (ICFO), Barcelona, Spain, for my pre-doctoral training. In April 2021, I joined PHAST and started my Ph.D. at ICFO. My current work is focused on developing detection systems and models for monitoring and imaging the oxygen and blood flow biomarkers in human subjects.

Sri Vamshi Krishna Damagatla

I hail from the city of Hyderabad in India and completed my Bachelors and Masters in Physics from the Sri Sathya Sai Institute of Higher Learning, India in 2020. However, I had a great liking for biology and wanted to always go back to it and Bio-photonics offered me a chance to integrate my expertise in physics with my love for biology. And so here I am – an ESR in PHAST and doing my PhD in the field of Time-Domain Diffuse Optics for medical imaging and spectroscopy in Politecnico di Milano, Italy. Being a part of PHAST is a whole experience – top-quality research, excellent training opportunities, traveling across Europe and meeting top-class research groups, amazing networking, and most importantly, being a part of a wonderful international research team. It's an opportunity of a lifetime, and I am glad I joined it.



More info about PHAST-ETN are available at www.phast-eu.unipr.it

Meet Prof. Antonio Pifferi

(Politecnico di Milano, Milano, Italy)



- What is your role in the PHAST project and why did you decide to be involved in the PHAST?

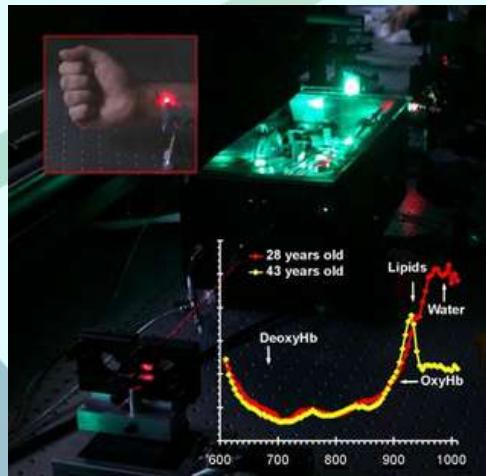
I am the supervisor of Vamshi Damagatla (ESR6). Together, we will expand the applicability of time-domain diffuse optics towards minimally invasive optical spectroscopy of tissues and non-contact assessment of optical properties. I was involved in PHAST preparation since the beginning when we were planning to gather forces to train excellent students in the fascinating and multidisciplinary field of biophotonics.

- Which skills are needed for the research activity?

Indeed, multiple skills are needed, from sound Physics knowledge, to experimental skills with lasers and detection systems, but also capability to understand the real clinical needs and to unravel new paths to support clinicians with better diagnostics and therapies. Sharing of competencies, best practices, visions are a plus in PHAST with a great chance to meet excellent scientists and work with smart early researchers.



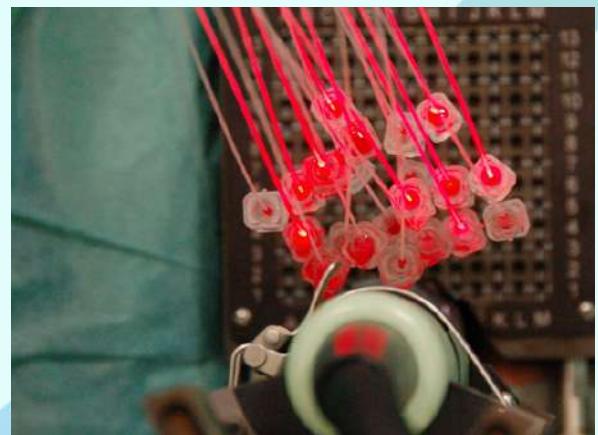
- Could you tell us your background and why you started working with Time-Domain Diffuse Optics?



I received my Bachelor and Master Degree in Nuclear Engineering from Politecnico di Milano, Italy, and then my PhD in Physics from Politecnico di Torino, Italy. I was enrolled in civil service at the "Mario Negri Institute for Pharmacological Research" which boosted my interest in addressing biomedical problems. I was granted an Individual Marie Curie Fellowship (at the time within the Human Capital and Mobility framework) to perform research at the Lund Institute of Technology, Sweden, under the supervision of prof. Stefan Andersson-Engels and prof. Sune Svanberg. Since my Master thesis, I have always worked with pulsed lasers and single-photon time-resolved detection for biomedical applications. Time-domain diffuse optics was the natural evolution, since it combined advanced laboratory set-ups with a fascination new physics on the random propagation of photons in biological tissues. The idea to collect one-by-one photons that have travelled in depth through the tissue, and to decipher what they experienced during their journey is absolutely exciting.

- What is the Future of Time-Domain Diffuse Optics, in your opinion?

Time-Domain Diffuse Optics is a wonderful technique for looking inside the human body. Differently from most clinical imaging modalities, which are largely based on morphological information, Diffuse Optics can provide insight into tissue composition, microstructure, and functional status. It can monitor, for instance, the oxygen demand in the brain following a cognitive or motor task, and also the change in collagen or blood content related to breast cancerous lesions. In the long run, I see it as a ubiquitous hand-held or non-contact appliance that can be used even at homecare to provide quick feedback on what is happening within our body. It can provide a unique non-invasive tool to assess the effect of lifestyle and nutrition on internal tissues to improve our health and life quality by preventing degeneration of tissue functions leading to disease.



PICTURES BY SVEN DÖRING

2022 European Researchers' Night

The Italian PHAST-ETN beneficiaries participated in the European researchers' Night on 30 September 2022 taking place in Parma and Torino.



Aizhan Issatayeva (ESR 1), Nikhitha Mule (ESR 13) and Sai Vamshi Krishna Damagatla (ESR 6) demonstrating the role of photonics in healthcare at the booth of the EU Researchers' Night.

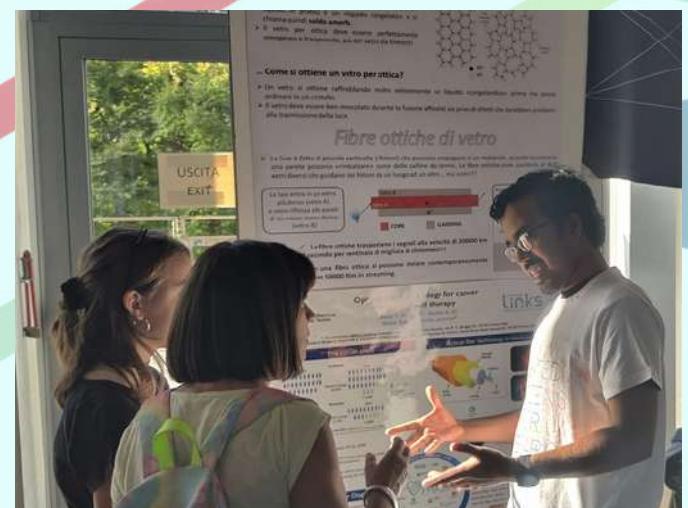
Malhar Nagar: "I participated in UNIGHT (United citizens for research) as part of European researchers' night in 2022, in Turin, Italy. Our group was provided with a stand named 'Opticamente-light up your mind', where I presented a poster detailing my research under the PHAST project and gave a brief demonstration about optical sensing. Interacting with people from diverse age groups and origins was, in fact, a truly fantastic experience, though at times quite challenging. It significantly aided me in improving my communication abilities".



From top left: Aizhan Issatayeva, Nikhitha Mule, Sai Vamshi Krishna Damagatla, Annamaria Cucinotta, Diana Grimaldi, Daniel Milanese, Federica Rizzi, Marina Marozzi, at the EU Researchers' Night in Parma.

Aizhan Issatayeva: "Research Night is a great opportunity for researchers to show the world of science to the general public through simple setups and demonstrations! I have shown an optical setup to illustrate the basic properties of light because that is the basis of my research! It was so exciting to see an audience of different ages starting from young children and students to the older generation, all very interested in my demonstrations and my project".

Jawad T P: "I was glad to be part of this innovative night aimed at transferring scientific knowledge to society and bringing research closer to public, especially children and youngsters. It was inspiring to see a lot of curious minds around having fun with science".



Nagar Malhar (ESR 4) and Jawad Jawad Talekkara Pandayil (ESR 11) at the EU Researchers' Night in Torino.

Nikhitha Mule: "I attended the European Researchers' Night 2022 event at University of Parma, Parma, Italy. It was a unique opportunity for me, as a researcher, to interact with citizens of all ages to bring awareness about what we are doing as part of PHAST Project. We have also demonstrated diffusion, fluorescence and other basic properties of light through simple experiments focusing on their application in the medical field as part of PHAST Team. With a sense of wonder and curiosity, the audience heard us speak all about light and its magical properties. I look forward to more such engaging events".

More info about PHAST-ETN are available at www.phast-eu.unipr.it