ZPH TECH 2026

Talks on Photonics Science and Technology @ IZTECH



October 19-20

Izmir Institute of Technology, Urla/IZMIR

IZPHOTECH 2026

Talks on Photonics Science and Technology @ IZTECH



Prof. Dr. Canan VARLIKLI
Advisor of Optics and Photonics Society

Dear Colleagues, Friends, and Students,

It is our honor and great pleasure to welcome you to the 2026 edition of the IZPHOTECH (Talks on Photonics Science and Technologies@IZTECH) conference series, organized as part of our celebration of the World Day of Photonics, proudly hosted by the İzmir Institute of Technology Photonics family.

Since the first IZPHOTECH meeting held in 2022, this symposium has established itself as an annual tradition rooted in the shared values of science, technology, and academic solidarity. Celebrating the World Day of Photonics, our gathering continues to serve as an active bridge connecting international researchers, young academics, undergraduate and graduate students, educators, and industry professionals—supporting the collective journey from fundamental physical research toward practical technology implementation.

We extend our heartfelt gratitude to our dedicated students and the organizing team for their tireless efforts. We are deeply grateful to OPTICA and the IZTECH Foundation for providing the essential financial support that makes organizing this meeting possible—free of charge—for the fifth consecutive year. We also thank all invited speakers and collaborators worldwide who generously dedicate their time to advance photonics.

IZPHOTECH 2026 brings together cutting-edge invited lectures covering advanced laser technologies, in-chip lithography, biophotonics, nanophotonics, and accelerator-based light sources. Alongside these specialized scientific talks, this year's program features an essential panel dedicated to educational institutions and strategies in Türkiye, providing an open platform to discuss how photonics education, workforce development, and sector integration can best prepare our students for future challenges.

Beyond synchronous participation, the official YouTube channel of the IZTECH Optics and Photonics Student Chapter transforms this symposium into a permanent, open-access archive for researchers and students unable to attend in real time. In our 2025 edition, 300 participants officially registered for the event, while the recorded sessions reached nearly 600 views on our channel. We believe these figures stand as a testament to how our student chapter actively give back to society— broadening access to scientific knowledge and ensuring that high-level photonics research remains permanently accessible to everyone.

We hope that the contributions in this booklet, along with our open educational archive, will continue to inspire and empower the photonics enthusiasts of tomorrow.

With warm regards and best wishes for a fruitful and engaging meeting!

IZPHOTECH 2026 PROGRAM

October 19, Monday

09:00 – 09:30 Registration

09:30 – 10:00 Opening Speeches

10:00 – 10:45 Opening Presentation

- **Rajesh Menon –** *From Photons to Information: Co-Designed Imaging Systems for Seeing More* (University of Utah)

10:45 – 11:00 Coffee Break

11:00 – 12:30 1st Session: Advanced Laser Technologies and Image Processing

- **Ferda Canbaz –** *From Seeing to Treating with Light: Towards Intelligent Orthopedic Surgery* (University of Basel)
- **Rana Asgari Sabet –** *In-Chip Laser Lithography of Silicon: Advances Enabled by Spatially Modulated Beams* (Bilkent University)

12:30 – 13:30 Lunch Break

13:30 – 15:00 2nd Session: TÜBİTAK 6550: National Research Centers Introduction

- **Serhat Tozburun –** *Izmir Biomedicine and Genome Center (IBG): Advancing Life Sciences and Health Technologies through Multidisciplinary Research* (Izmir Biomedicine and Genome Center)
- **Ramazan Şahin –** (Türkiye National Observatories)

15:00 – 15:15 Coffee Break

15:15 – 16:00 2nd Session continued:

- **Ömer Yavaş –** *Accelerator Based Light Sources and Turkish Accelerator and Radiation Laboratory (TARLA)* (Turkish Accelerator and Radiation Laboratory)

October 20, Tuesday

09:30 – 11:30 3rd Session: Biophotonics

- **Ali Karatutlu –** *Advancing Photonic Materials Through Synchrotron Radiation Techniques* (Sivas University of Science and Technology)
- **Arif Engin Çetin –** *From Photonics to Intelligent Lab Infrastructure: Integrating Biosensing, Imaging, and Automation* (Izmir Biomedicine and Genome Center)

11:00 – 11:15 Coffee Break

11:15 – 12:45 4th Session: Nanophotonics

- **Shi-Wei Chu –** *Seeing Beyond Diffraction: Mie-Enhanced Photothermal Nonlinearity/Bistability for Super-Resolution Semiconductor Inspection* (National Taiwan University)
- **Muhammed Zeki Güngördü –** *AI-Driven Terahertz Photonics: From Metamaterial Polarization Control to Biomedical Imaging* (Gazi University)

12:45 – 13:45 Lunch Break

13:45 – 14:30 5th Session: Current Developments in Photonics

- **Ömer İlday** – *Engineering Emergence with Lasers* (Ruhr University)

14:30 – 15:30 6th Session: Panel: Institutions and Strategies in Photonics Education Across Türkiye

- **Atilla Aydınlı**
- **H. Azize Malay**
- **Hakan Bozkurt**
- **Onur Koca**
- **Michael Barbier**
- **Ömer İlday**

15:30 – 16:15 Closing Ceremony



Rajesh Menon

Rajesh Menon is a Professor of Electrical and Computer Engineering at the Univ. of Utah and Chief Technology Officer of Oblate Optics, which is commercializing flat-optics technologies pioneered in his laboratory. His research combines nanofabrication, computational design, and optical engineering to develop inverse-designed photonics, flat lenses, and unconventional imaging systems. He holds more than 45 patents, has published extensively in peer-reviewed journals, and has co-founded four technology companies to translate research advances into practical technologies. He is a Fellow of Optica and SPIE, and a Member of the National Academy of Inventors. His honors include the ICO Prize, NASA Early-Stage Innovations Award, NSF CAREER Award, and IEEE Photonics Society Distinguished Lectureship. Rajesh earned his S.M. and Ph.D. from MIT and collaborates extensively with academic, industry, and government partners worldwide.

From Photons to Information: Co-Designed Imaging Systems for Seeing More

Conventional cameras capture only a small fraction of the information carried by light. Rich properties such as spectrum, polarization, depth, coherence, and fast temporal dynamics are typically discarded, or require bulky instruments and sequential measurements to recover.

In this talk, I will describe a different approach to imaging in which photonics, sensors, and computational algorithms are designed together to capture much more of the information available from a scene. Inverse-designed and unconventional optical elements can encode otherwise inaccessible physical information directly into sensor measurements, while computational methods, including machine learning, decode these measurements into high-dimensional images. When combined with emerging sensor technologies such as event-based cameras, this approach can also capture dynamics at timescales far beyond those accessible to conventional frame-based imaging.

I will present examples spanning spectral and polarization imaging, ultrafast sensing, computational microscopy, and compact flat-optics systems, with applications ranging from biomedical imaging and industrial inspection to remote sensing and astronomy. More broadly, these results point toward a transition from cameras designed primarily to form images to information-aware imaging systems that jointly optimize the physics and computation for the information (or task) that ultimately matters. Such systems offer new opportunities to dramatically reduce size, weight, power, data volume, and latency while expanding what cameras can measure.

Ferda Canbaz



Ferda Canbaz, PhD, is a laser physicist and Group Leader of the Center for Intelligent Optics at the Department of Biomedical Engineering, University of Basel, Switzerland. Her research focuses on the development of intelligent optical technologies for biomedical imaging, diagnosis, and therapy, with particular emphasis on laser-tissue interactions, optical coherence tomography, spectroscopy, beam engineering, and optical feedback for image-guided and automated surgery.

She received her BSc in Engineering Physics from Istanbul Technical University, followed by an MSc in Optoelectronics and Photonics Engineering and a PhD in Physics from Koç University, where her research focused on ultrafast solid-state lasers. She joined the Department of Biomedical Engineering at the University of Basel as a postdoctoral researcher in 2018 and subsequently became a junior group leader and, in 2024, Group Leader of the Center for Intelligent Optics.

Her current research brings together laser engineering, optical imaging and spectroscopy with machine learning and robotic technologies to develop precise, minimally invasive, and increasingly autonomous approaches to surgery.

Webpage of the group: https://dbe.unibas.ch/en/research/lasers-robotics/center-for-intelligent-optics/

From Seeing to Treating with Light: Towards Intelligent Orthopedic Surgery

Optical technologies provide unique opportunities to combine tissue characterization, real-time monitoring, and precise tissue modification within a single surgical workflow. But can optical signals provide sufficient information to identify tissue and guide an intervention? Can laser-tissue interactions be controlled to achieve efficient and selective ablation? And how can sensing and treatment be integrated into a closed-loop surgical system?

This talk will present our work toward addressing these questions in orthopedic surgery. We investigate optical coherence tomography and spectroscopic techniques for structural and biochemical tissue characterization, and in our application to monitor laser-tissue interactions. In parallel, laser parameters, beam delivery, and beam shaping are engineered to improve the precision and efficiency of hard- and soft-tissue ablation. Finally, the integration of optical feedback with data-driven analysis and robotic control will be discussed as a pathway toward adaptive, automated surgical interventions.



Rana Asgari Sabet

I hold a Bachelor's and Master's degree in Atomic and Molecular Physics (Laser) from the Department of Physics at the University of Tabriz, Iran. I received my Ph.D. in Photonics in 2015 from the Research Institute for Applied Physics and Astronomy at the University of Tabriz, Iran. Following my Ph.D., I served as a lecturer at the University of Tabriz and the University of Bonab. Also, I conducted research as a postdoctoral fellow supported by the Iranian National Science Foundation. In 2019, I joined the Photonic Devices Laboratory at Bilkent University, Ankara, Turkey, as a postdoctoral researcher. During my research, I have actively contributed to projects focusing on laser material interactions to develop functional optics and photonics elements in a range of materials, including liquid crystals, silicon, glass, and silicon-on-insulator (SOI). My research has resulted in publications in high-impact journals, presentations at international conferences, and issued patents.

In-Chip Laser Lithography of Silicon: Advances Enabled by Spatially Modulated Beams

Silicon (Si) plays a central role in photonics technologies. While conventional nanolithography techniques have enabled increasingly precise patterning of Si surfaces, the ability to directly create nanoscale structures deep within its volume has only recently emerged, opening a new paradigm of 3D in-chip nanofabrication. In this talk, I will discuss our recent advances in feature size and symmetry control of laser writing inside Si.

First, I will present our approach to reducing the size of subsurface laser-induced modifications by an order of magnitude, achieving feature sizes down to 100 nm, inside Si using Bessel beams. These results demonstrate the potential of spatially modulated beams to overcome the conventional limits of tightly focused, nanosecond-pulsed Gaussian beams and enable high-resolution volumetric nanofabrication. I will then introduce Vortex beams, including scalar, vector, and composite vortices, as a second class of spatially modulated beams that provide additional control over the symmetry of the written structures, enabling the formation of annular and chiral features directly in Si.

These results demonstrate how spatial light modulation can expand the capabilities of direct laser writing from conventional three-dimensional microfabrication toward maskless, nanoscale, and symmetry-controlled fabrication inside Si. The emerging in-chip approach offers new opportunities for 3D nanophotonics systems, micro/nanofluidics, and 3D electronic-photonic integrated systems.

Serhat Tozburun



Serhat Tozburun is an associate professor of biomedical engineering at Dokuz Eylul University, which he joined in 2016. Prior to that, he was a postdoctoral fellow at Harvard Medical School's Wellman Center for Photomedicine from 2012 to 2016. He received his PhD from the University of North Carolina at Charlotte in 2012. He is the recipient of numerous awards and recognitions, including the prestigious 2024 ERC consolidator grant, 2020 Science Academy's Young Scientist Award, 2018 Marie Skłodowska-Curie Actions – Individual Fellowships, 2018 Turkish Academy of Sciences Outstanding Young Scientist Award, and 2012 SPIE Optics and Photonics Scholarship. His research activities are in the general area of biomedical optics, with publications in renowned journals including Optics Letters, Biomedical Optics, Optics Express, Journal of Biophotonics, and Nature Photonics. He has repeatedly served as a reviewer for various journals, including Biomedical Optics, Optics Letters, and Optics Express, and as an advisory board member of TUBITAK.

Webpage: http://www.linkedin.com/in/serhat-tozburun-39627946

Izmir Biomedicine and Genome Center (IBG): Advancing Life Sciences and Health Technologies through Multidisciplinary Research

The Izmir Biomedicine and Genome Center (IBG), established in 2018 under Law No. 6550 as Türkiye's first Thematic Research Center, brings together multidisciplinary expertise to advance life sciences and health technologies. Located on the health campus of Dokuz Eylül University, IBG integrates fundamental research with technological innovation to address challenges in disease prevention, diagnosis, and treatment. This talk will provide an overview of IBG's research ecosystem and highlight the Biophotonics and Optical Imaging Lab, where interdisciplinary approaches in biophotonics, optical imaging, and biomedical engineering are being developed for biomedical research and clinical applications. The presentation will highlight how advanced imaging technologies and fundamental life-science research can be translated into innovative technologies, products, and services, contributing to IBG's vision of becoming a leading international research center in life sciences and health technologies.



Ramazan Şahin

Ramazan Şahin received his B.S., M.S., and Ph.D. degrees in Physics. He is currently an Associate Professor in the Department of Physics at Akdeniz University and also serves as the Technical Deputy Director at the Türkiye National Observatories (TUG & DAG campuses under the Ministry of Industry and Technology / TÜBİTAK). His research focuses on nanophotonics, optical forces and optical manipulation, metamaterials, plasmonics, and advanced optical instrumentation for space and astronomical observations. He has led numerous national research projects supported by TÜBİTAK and contributed significantly to the development and integration of high-precision optical technologies in Türkiye's national observatories.

Space Sciences Ecosystem: Türkiye National Observatories

Ground-based optical astronomy and space situational awareness heavily rely on cutting-edge photonics, precision optomechanics, and sensor technologies. Operating at the intersection of fundamental physics and observational engineering, modern observatories face severe challenges in atmospheric distortion, high-sensitivity detection, and long-term instrument stability in harsh environments.

This talk will provide an extensive overview of the Turkish space sciences and observational infrastructure, focusing on the facilities and technological ecosystems of the Türkiye National Observatories (TUG and DAG). The presentation will highlight the optical instrumentation, active/adaptive optics architectures, focal plane arrays, and optoelectronic subsystems driving current and next-generation astronomical observations in Türkiye. Furthermore, the talk will discuss future strategic roadmaps, user facilities, and collaboration opportunities between the national observatories and the broader optics and photonics research community.

Ömer Yavaş



Ömer Yavaş is a Professor of High Energy Physics at Ankara University, where he also received his B.S., M.S., and Ph.D. degrees in Physics Engineering.

Throughout his career, he has authored over 250 scientific publications, supervised more than 40 graduate theses, and conducted research at prominent global accelerator centers including CERN, DESY, and FNAL.

He has been a driving force in establishing national accelerator infrastructure, serving as the Founding Director of the Ankara University Institute of Accelerator Technologies and leading the Turkish Accelerator Center project—including the TARLA facility—for nearly two decades.

He currently serves as the Turkish Team Leader and Collaboration Board Member for the CERN Compact Linear Collider (CLIC) project. His scientific contributions have been recognized with several prestigious honors, notably the American Physical Society (APS) Marschak Lectureship Award and the Turkish Physical Society Honor Award.

Accelerator Based Light Sources and Turkish Accelerator and Radiation Laboratory (TARLA)

The fundamental characteristics and parameters of synchrotron radiation, free-electron lasers, and bremsstrahlung which serve as radiation sources based on particle accelerators are introduced, alongside their application techniques and the fields in which they are utilized for R&D studies and the global distribution of these radiation sources is also presented.

Furthermore, detailed information is provided about Turkish Accelerator and Radiation Laboratory (TARLA) as a superconducting electron accelerator based free electron laser facility that is established as the first facility of Turkish Accelerator Center (TAC). TARLA attained national laboratory status in 2020.

This presentation will describe the proposal, planning, construction, commissioning, operation, and transformation of TARLA into a national laboratory. It will also present ongoing and planned research activities carried out using its electron beam, free-electron laser, and bremsstrahlung beamlines, together with the experimental stations developed for these studies. In addition, national and international collaborations and potential new capabilities that could be introduced in response to user needs will be discussed.



Arif Engin Çetin

Arif E. Cetin is a Group Leader at Izmir Biomedicine and Genome Center (IBG), and Associate Professor in the Department of Biophysics, Dokuz Eylul University, Türkiye. Dr. Cetin received his B.S. degree in Electrical and Electronics Engineering and his M.S. degree in Electrical and Computer Engineering from Koç University, Türkiye. He earned his Ph.D. in Electrical Engineering from Boston University, USA. Following his doctoral studies, he conducted postdoctoral research at the Swiss Federal Institute of Technology in Lausanne (EPFL), Switzerland, and at the Massachusetts Institute of Technology (MIT), USA. He later worked as a Research Scientist at Omniome Inc., USA. Dr. Cetin's research focuses on optofluidic platforms for ultra-sensitive, label-free biodetection. He develops portable and high-throughput biosensing systems tailored for resource-limited settings. His work includes plasmonic growth-rate cytometry platforms for determining therapeutic susceptibility of cancer cells in personalized drug therapy, as well as a label-free, high-throughput DNA sequencing approach. In addition, he designs and engineers integrated biomedical devices for intelligent laboratory automation. Dr. Cetin is the author of more than 100 published works, holds 5 patented technologies, and has delivered over 100 invited and contributed scientific talks.
Personal Website: http://biophotonics.tech/

From Photonics to Intelligent Lab Infrastructure: Integrating Biosensing, Imaging, and Automation

Photonics has transformed biosensing by enabling sensitive, label-free, and miniaturized detection of biological interactions. However, translating photonic sensing from proof-of-concept devices into practical biomedical tools requires more than improving optical sensitivity. Sample handling, fluidics, imaging, data acquisition, and system-level integration must all be considered interconnected components of the sensing workflow. In this talk, I will present our journey from nanophotonic structures and plasmonic biosensors toward integrated, intelligent laboratory platforms. I will first discuss resonant nanophotonic architectures for label-free molecular detection, including their integration with computational imaging and optofluidics for portable, real-time sensing. Biomedical applications including biomarker detection, therapeutic response monitoring, and cellular analysis will be presented. I will then highlight our recent efforts to move beyond standalone biosensors by integrating sensing with microfluidics, automated liquid handling, microscopy, incubation, and computational analysis. These developments enable autonomous experimental workflows where biological samples can be manipulated, monitored, and analyzed within compact platforms. Together, these studies illustrate an evolution from engineering individual sensors toward building integrated laboratory infrastructure, providing a pathway toward accessible, reproducible, and autonomous biomedical experimentation.

Shi-Wei Chu



Shi-Wei Chu received the B.S. degree in Electrical Engineering and PhD degree in Photonics and Optoelectronics both from National Taiwan University (NTU). He is currently a full professor of Physics, as well as serving as the Vice President of Student Affairs in NTU. He has been dedicated to the development of innovative optical microscopy technologies. In neuroscience, his recent emphasis is to expand the optical toolbox for neuroscience, in particular pushing the limit of contrast, resolution, speed, and volume size with multiphoton fluorescence. In material science, he pioneers the development of optical super-resolution inspection for metals and semiconductors beyond diffraction limit.

Seeing Beyond Diffraction: Mie-Enhanced Photothermal Nonlinearity/Bistability for Super-Resolution Semiconductor Inspection

As semiconductor and nanophotonic devices continue to shrink, optical inspection methods must resolve structural features far below the conventional diffraction limit. In this keynote, I will discuss how Mie-enhanced photothermal nonlinearity in high-index dielectric nanostructures provides a practical physical route toward far-field super-resolution inspection of semiconductor devices. Building on our studies since 2020, we show that silicon nanostructures supporting Mie resonances can confine optical energy within nanoscale volumes, generating localized heating and a strong thermo-optic response. This feedback produces large, reversible nonlinear modulation of scattering/absorption, corresponding to exceptionally large effective nonlinear refractive-index changes under moderate optical excitation.

By incorporating this intrinsic nonlinear response into confocal laser-scanning microscopy, the effective point-spread function can be reshaped, allowing spatial localization and feature discrimination beyond the diffraction limit. I will highlight how Mie-enhanced photothermal nonlinear scattering enables super-resolution visualization of critical nanoscale features relevant to integrated photonic and electronic circuits. Furthermore, the positive feedback of photothermal and thermo-optic loops provides novel optical bistability that pushes the resolution limit. These results establish photothermal nonlinearity as a nondestructive, far-field, and potentially high-throughput strategy for semiconductor inspection, while pointing to the broader role of active dielectric nanophotonics in next-generation optical metrology and device characterization.



Muhammed Zeki Güngördü

I have earned my bachelor's degree in Electrical and Electronics Engineering from Erciyes University in 2013, followed by master's and Ph.D. degrees in Electrical Engineering from the University of Alabama in 2016 and 2023, respectively. During my studies in the United States, I have published journal articles, presented at conferences, and served as a lead researcher on several projects funded by NASA and the U.S. Army. Since February 2026, I have been an assistant professor in the Department of Photonics, Faculty of Applied Sciences, at Gazi University. My research interests include photonics, terahertz spectroscopy and imaging, metamaterials, micro- and nanofabrication, and artificial intelligence.

Website: https://avesis.gazi.edu.tr/muhammedzeki.gungordu

AI-Driven Terahertz Photonics: From Metamaterial Polarization Control to Biomedical Imaging

Terahertz (THz) photonics offers opportunities for advanced polarization control and biomedical imaging, yet designing functional devices and extracting useful information from measured signals remain challenging. This talk presents two complementary data-driven approaches to these problems. First, a tandem neural network is used for the inverse design of reflective stereo-metamaterial polarizers. By targeting a desired ellipticity-angle spectrum, the model predicts structural parameters for converting linearly polarized THz waves into circularly or elliptically polarized waves. Second, independent component analysis is applied to THz spectroscopic images of skin phantoms containing tumor-like inclusions. The method separates diagnostically relevant features from background contributions and improves image contrast and tumor delineation across selected frequencies. Together, these studies illustrate how computational methods can support both the design of THz components and the interpretation of biomedical images. The talk will discuss their underlying methods, experimental and simulated results, and prospects for more capable THz systems, while acknowledging practical challenges in translation to applications.

Ali Karatutlu



Ali Karatutlu is an Associate Professor in the Department of Engineering Basic Sciences within the Faculty of Engineering and Natural Sciences at Sivas University of Science and Technology, specializing in specialty optical fiber fabrication, mid-infrared lasers, and integrated photonic devices. He leads cutting-edge research initiatives focused on advanced manufacturing of mid-IR laser sources for environmental and industrial sensing, multifunctional integrated optical chips, and lab-on-fiber sensing platforms tailored for biomedical and healthcare diagnostics.

In addition to his role at Sivas, he maintains a part-time appointment at Bilkent University UNAM, extending a nearly decade-long tenure in advanced fiber research at the institution. His core contributions at UNAM include spearheading the design, preform processing, and drawing of complex specialty fibers, featuring kilowatt-class active laser fibers and high-birefringence polarization-maintaining (PM) fibers for high-power laser and sensing systems.

He earned his Ph.D. from the School of Physics and Astronomy at Queen Mary University of London (QMUL), UK, in 2014, where his research concentrated on materials physics and optical characterization of nanostructured materials. Active in international professional leadership, Assoc. Prof. Karatutlu serves as an Executive Committee Member of OPTICA's Fiber Modelling and Fabrication Technical Group (FFTG), contributing to global technical exchange, community outreach, and academic-industrial collaborations in fiber optics and waveguide technologies. He is also member of German Physical Society where he serves in the Atomic, Molecular, Quantum Optics and Photonics (SAMOP) and the Condensed Matter Sections (SKM). He has authored or co-authored 29 SCI-indexed journal articles, over 30 international conference proceedings, 6 book chapters and 1 approved patent and 2 pending patent applications.

Advancing Photonic Materials Through Synchrotron Radiation Techniques

This presentation highlights the investigation of photonic materials (optical fibers and thin films) using advanced synchrotron radiation techniques. By utilizing soft and hard X-ray spectroscopy and X-ray computed tomography, these methods enable in-situ characterization under relatively harsh conditions—such as extreme temperature and radiation—providing a complete understanding of their morphological, electronic, and structural properties. The results will be demonstrated from our recent studies in the The Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME).



F. Ömer İlday

Dr. F. Ömer Ilday's research spans nonlinear and complex systems, laser–matter interactions, and laser physics, where basic science inspires new engineering, which, in turn, enables further scientific discovery. He received his Ph.D. in Applied Physics from Cornell University in 2003 and was a postdoctoral associate at MIT from 2003 to 2006 before joining Bilkent University as a faculty member. He has received three European Research Council (ERC) grants, including the first ERC grant in basic science awarded in Türkiye, and was awarded the Alexander von Humboldt Professorship in 2023. He is a member of the Science Academy and Academia Europaea. He is Chair of Nonlinearity Engineering and founding Director of the Center for Complex Interactions at Ruhr University Bochum in Germany.

Engineering Emergence with Lasers

Emergence, the spontaneous formation of macroscopic order from many interacting components far from thermodynamic equilibrium, is ubiquitous in nature, from the atomic to the galactic scale. We have identified a common organizing principle: nonlinear feedback, where each interaction changes the conditions for those that follow, allowing qualitatively new structures and collective behavior to emerge. We first explored this principle through nonlinear laser lithography (NLL), where successive laser pulses interact with an evolving material surface, producing spontaneously organized patterns far smaller than the laser beam itself. We discovered NLL by drawing an analogy with the modelocking of lasers, although this analogy proved incomplete. This led us to ask whether a different form of modelocking could complete the analogy to NLL. Recently, we have identified such a regime, which we call second modelocking, in which large populations of ultrafast pulses organize collectively through nonlinear interactions. Beyond its fundamental interest, second modelocking offers a route to ultrahigh-repetition-rate pulse trains, a key enabler for collective laser–matter interactions. These developments raise a broader question: can nonlinear feedback be harnessed not merely to understand emergence, but to engineer it?

Panel: Institutions and Strategies in Photonics Education Across Türkiye

Rapid advances in photonics as a field of science and technology have made collaboration among educational institutions, research organizations, and industry increasingly important. This panel explores the current landscape of photonics education in Türkiye, highlighting the roles of educational institutions, research centers, universities, and industry stakeholders.

Existing educational initiatives aimed at promoting awareness and understanding of photonics across all educational levels will be examined. Furthermore, teacher professional development will be addressed, emphasizing the need for targeted training and resources to equip educators to teach photonics concepts effectively. Strategies for strengthening photonics literacy among students, educators, and the broader community will also be discussed, with an emphasis on enhancing understanding of the relevance and applications of photonics across various industries.

Examples will illustrate how university-industry partnerships can enhance learning experiences, strengthen students' awareness of photonics, and provide opportunities to explore photonics as a field of science, technology, and engineering. Successful examples of such collaborations will be highlighted, demonstrating their contributions to advancing photonics education and preparing students for careers in this rapidly evolving field. Finally, the panel aims to identify challenges, opportunities for institutional collaboration, and future directions for building a more inclusive and sustainable photonics education ecosystem in Türkiye.



Hümeyra Azize Malay

Hümeyra Azize Malay is a researcher and educator in the Department of Mathematics and Science Education at Bursa Uludağ University. Her academic research focuses on science, optics, and photonics education, inquiry-based STEM pedagogy, curriculum development, and instructional design for 21st-century technology literacy. She has conducted thematic and systematic review studies on optics and photonics education across elementary, secondary, and higher education curricula, presenting her findings at prominent international platforms including Optica's Education and Training in Optics and Photonics (ETOP) conferences. Her work actively addresses educational equity, teacher professional development, and strategic roadmaps for integrating emerging light technologies into nationwide educational frameworks.

Hakan Bozkurt



Research Assistant Dr. Hakan Bozkurt completed his undergraduate and master's degrees at Ege University and received his Ph.D. in Photonics Science and Engineering from İzmir Institute of Technology (IZTECH) in 2025. He has been serving as a research assistant at the same institute since 2019.

His research centers on organic optoelectronic devices and display technologies, with extensive work in the fabrication and characterization of OLEDs, QLEDs, PMQLEDs, and organic photovoltaic devices. He has taken part in research projects funded by TÜBİTAK (The Scientific and Technological Research Council of Türkiye), contributing notably to the development of a 16 × 16-pixel PMQLED display. Currently, his research focuses on organic field-effect transistors (OFETs) and vertical organic light-emitting transistors (VOLETs).

Dr. Bozkurt actively contributes to curriculum and laboratory development in the Fundamentals of Optics and Photonics, Applied Electronics, and Optoelectronics, designing experimental setups and authoring comprehensive laboratory manuals. In addition, he serves as an advisor for undergraduate research projects under TÜBİTAK 2209 programs, placing strong emphasis on hands-on laboratory experiences and inquiry-driven learning. Notably, one of the undergraduate projects under his supervision resulted in the design and implementation of a functional, compact goniophotometer setup tailored for educational laboratory environments.



Onur Koca

Onur Koca is the General Manager of OZ Optics Turkey. Throughout his extensive career, he has held key executive and board member positions across various sectors. His previous leadership roles include serving as the CEO of ICS Group, and as Managing Director at G4S Security Services, Parker Climate Control Systems, and Jotun Turkey. Additionally, he has served as a board member for prominent corporations such as Yaşar Holding, DYO, Viking Kağıt, and Çelebi Aviation Holding. He also actively contributes to university-industry collaborations as a member of the Faculty of Science Advisory Board at the Izmir Institute of Technology (IZTECH). With his deep expertise in strategic management and operational excellence, he has been instrumental in driving innovation and growth within high-tech industries. His participation in this panel reflects his ongoing commitment to bridging the gap between academic research and industrial applications in the photonics sector.



Atilla Aydınlı

Prof. Dr. Atilla Aydınlı served as the moderator for the panel session. He is a highly distinguished academic and a leading figure in the fields of physics and photonics in Türkiye. With a long-standing academic career, most notably as a faculty member at Bilkent University's Department of Physics and as a prominent researcher at the National Nanotechnology Research Center (UNAM), his extensive research focuses on nanophotonics, optoelectronics, integrated photonics, and sensor technologies. His visionary leadership has been crucial in establishing state-of-the-art laboratory facilities that bridge the gap between fundamental physics and applied engineering.

Over the decades, he has spearheaded numerous high-impact national and international research projects, significantly contributing to the global scientific community. Furthermore, his prolific academic output includes highly cited publications in top-tier international journals, reflecting his dedication to advancing the frontiers of optical sciences. Throughout his career, Prof. Dr. Aydınlı has played a pivotal role in advancing national photonics research infrastructures and has mentored countless researchers and students across the country.



Michaël Barbier

Asst. Prof. Dr. Michaël Barbier is a faculty member in the Department of Photonics at the Izmir Institute of Technology (IZTECH). As an active researcher and educator, he is dedicated to advancing the academic and scientific development of the photonics community. He is the founder and Group Leader of the Adaptive & Integrated Photonics Lab (AIPLAB) at IZTECH. His cutting-edge research primarily focuses on adaptive optics, active nanoparticle systems, and the development of novel photonic integrated circuit elements. By leveraging advanced computational models, machine learning techniques, and inverse design algorithms, his laboratory effectively bridges theoretical modeling with dedicated experimental setups. He is also the principal investigator for major TÜBİTAK-supported projects investigating complex phenomena in colloidal systems. In addition to his academic responsibilities, he is a core member of the organizing team for the IZPHOTECH symposium, actively supporting student initiatives, international scientific collaboration, and the growth of optics and photonics education in Türkiye.

ZPH TECH 2026

Talks on Photonics Science and Technology @ IZTECH

TEAM

Prof. Dr. Canan VARLIKLI	Advisor of Optics and Photonics Society
Assoc. Prof. Dr. Hasan GÖKTAŞ	IEEE Photonics & SSCS Society Turkey Chapter Chair
Okan KOZAKBAŞ	President of Optics and Photonics Society
Ebrar ARDA	President of IEEE Photonics Student Chapter
Asst. Prof. Dr. Michaël BARBIER	Faculty Member in Department of Photonics
Dr. Hakan BOZKURT	Research Assistant in Department of Photonics
Metin TAN	Research Assistant in Department of Photonics
Buğra ŞEN	Research Assistant in Department of Photonics
Umut Baran GÜNDÜZ	Student in Photonics Science and Engineering
Ilgın ŞERİFOĞLU	Student in Department of Photonics
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Ömer ÖZDOĞAN	Student in Department of Photonics
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