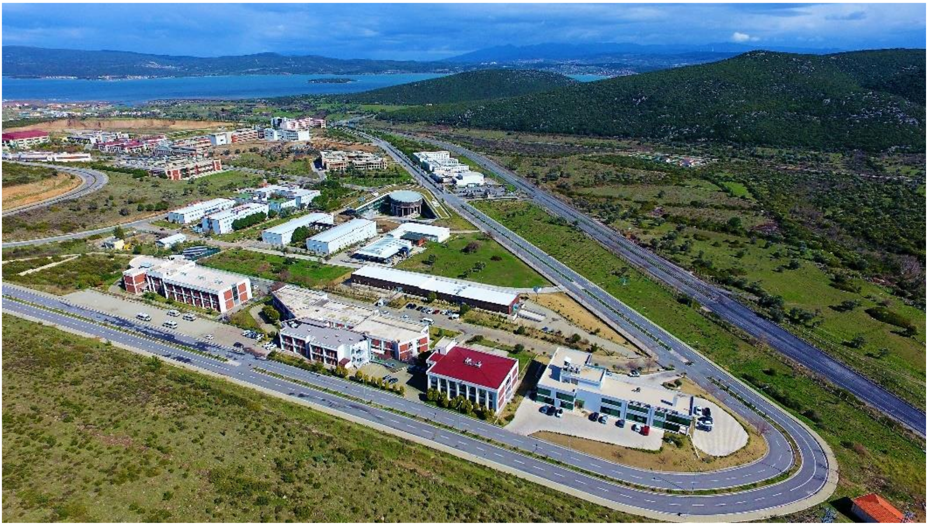
# IZPHOTECH 2022

Talks on Photonics Science and Technology @ IZTECH



October 20-21

Izmir Institute of Technology, Urla/IZMIR

**Prof. Dr. Canan VARLIKLI**
*Head of IZTECH Department of Photonics*

Talks on Photonics Science and Technologies @IZTECH, which is organized for the first time this year, has been planned to celebrate the World Photonics Day with the contributions of the Izmir Institute of Technology Photonics research family, which I am honored to be a member of.

Our undergraduate and graduate students are the most important members of the IZTECH Photonics family. IZTECH Optics and Photonics and IEEE Photonics student chapters were established with their initiatives and became members of OPTICA (formerly OSA) and IEEE Photonics Society, respectively. I would like to thank our students and the named international organizations for their supports.

I am grateful to eleven precious speakers from eight countries, who will share their valuable contributions to photonics science and technologies within the scope of IZPHOTECH-2022, for dedicating their most valuable assets, time, to us.

I hope that these valuable speeches, which will be steamed live and archived on the official youtube channel of the IZTECH Optical and Photonics Student Chapter, will contribute to many Photonics enthusiasts.

Sincerely

IZPHOTECH 2022

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OPS

Optics and Photonics Society

IZMIR INSTITUTE OF TECHNOLOGY

OSA

OPTICA

IEEE Photonics Society

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IZMIR INSTITUTE OF TECHNOLOGY

IZTECH

photonics

Fotonik Bölümü

Department of Photonics

# IZPHOTECH 2022 PROGRAM

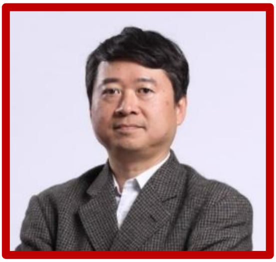
**October 20, Thursday**

**09:30 – 10:00** Opening
**10:00 – 11:00 Sheng-Lung Huang** – *Optical Coherence Tomography: Technologies and Challenges* (National Taiwan University)
**11:00 – 12:00 Atilla Aydınlı** – *Evolution of Laser Technologies*
**12:00 – 14:00** BREAK
**14:00 – 15:00 Elias Stathatos** – *All printed third generation solar cells and modules made of perovskites under ambient conditions* (University of Peloponnese)
**15:00 – 16:00 Serap Güneş** – *Recent Developments in Emerging PV Technologies* (Yıldız Technical University)
**16:00 – 17:00 Mehmet Öğüt** – *Applications of Photonics in remote sensing* (NASA JPL)
**17:00 – 18:00 Sudip Shekhar** - *Scaling up silicon photonic-based accelerators: Challenges and opportunities* (University of British Columbia)

**October 21, Friday**

**10:00 – 11:00 Serhat Tozburun** – *Photothermal Coagulation of the Superficial Layer of the Esophagus* (9 Eylül University)
**11:00 – 12:00 Wim Bogaerts** - *Programmable Photonics* (Ghent University and IMEC)
**12:00 – 14:00** BREAK
**14:00 – 15:00 Richard Zeltner** - *Sensing using optically trapped micro particles* (Menlo Systems GmbH)
**15:00 – 16:00 Hasan Göktaş** – *Photonic-MEMS for Programable Photonic Integrated Circuits* (Izmir Institute of Technology)
**16:00 – 17:00 Amr Helmy** – *Efficient Plasmonic Circuits for Data Communications* (University of Toronto)

## Sheng-Lung HUANG



Dr. Sheng-Lung Huang received the B.S. degree from the Department of Electrical Engineering, National Taiwan University, in 1986, and the M.S. and Ph.D. degrees from the Department of Electrical Engineering, University of Maryland, College Park in 1990 and 1993, respectively.

He joined the Graduate Institute of Photonics and Optoelectronics (GIPO) and the Department of Electrical Engineering, National Taiwan University, in 2006. He is now a Distinguished Professor. He served as the Chairman of GIPO from 2007 to 2010. He was also a guest professor at the Abbe School of Photonics, Friedrich-Schiller University of Jena, Germany, in 2014. Before joining National Taiwan University, he served as Chairman of the Institute of Electro-Optical Engineering, National Sun Yat-Sen University, from 2003 to 2005.

Dr. Huang's research interest is in crystalline fiber-based devices and applications. He pioneered the development of cellular-resolution optical coherence tomography and has used it clinically in the early-stage diagnosis of cancers and diseases. In 2014, he co-founded the Apollo Medical Optics (AMO) and served as the Chief Technology Officer. Later, he served as the Chief Science Officer until 2021. The AMO won the National Innovation Award in 2020. Dr. Huang served as Chairman of IEEE/LEOS (now IEEE/PS) Taipei Chapter from 2005 to 2006. He was a steering board member of the European Master of Science in Photonics (EMSP). Dr. Huang served as an Associate Editor of the IEEE

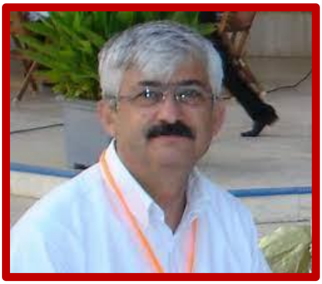
Photonics Journal and was a Topical Editor, Optics Letters, for 6 years (2005–2011). He was a Guest Editor for Taiwan Photonics Society Quarterly in 2008.

Dr. Huang has received the Outstanding Research Award from the Ministry of Science and Technology and the University/Industry Cooperation Award from the Ministry of Education. He has also been jointly awarded Chimei Innovation Excellence Award and Optical Communications Elite Award. He is a Fellow of Optica (formerly OSA).

**Optical Coherence Tomography: Technologies and Challenges**

Optical coherence tomography (OCT) has now become a standard of care, impacting the treatment of millions of people every year. There is tremendous clinical and preclinical progress in diagnosing cancers and various physiological, inflammatory, infectious, and pigmentary disorders and diseases in specialties of ophthalmology, cardiology, dermatology, gastroenterology, neurosurgery, etc. OCTs have also madean impact on nondestructive industrial testing and evaluations. In recent years, OCT technologies have been advancing rapidly in cross-sectional and en face imaging speeds, spatial resolutions, and functionalities due to breakthroughs in broadband light sources and various micro-optical probes for reaching the deep and interior tissues and organs. Dynamic anatomical variations can also be assessed on a time scale beyond milliseconds. Morphological recognition, dynamic analyses, and artificial intelligence (AI) algorithms utilizing the backscattered light from subcellular structures will be addressed in the talk. The AI performance could be explained by visualizing the feature activations of the neural network in response to the cellular structures of human tissues. In the talk, the challenges of leveraging the ever-escalating techniques in applying deep learning algorithms to medical image analysis and translation that could accelerate the acceptance of OCT among clinicians in reading and diagonalizing the OCT tomograms will also be addressed.

## Atilla AYDINLI



Dr. Aydınlı, finished his Ph.D. at the University of Virginia in 1980. After a postdoctoral stint at Kansas State University he was appointed at the Engineering Physics Department of Hacettepe University in Ankara. He was awarded a scholarship to do research at Padova University where he used accelerators to study strain in epitaxial layers of InGaAs on GaAs. In 1991 he joined Bilkent University Physics Department, where set up a semiconductor device lab (w/R. Ellialtıoğlu) and did research on semiconductor lasers, light emitting diodes and infrared detectors. During this time, he was also a Fulbright Professor at Electrical and Computer Engineering Department at UC Santa Barbara.

He Joined Uludağ University Electrical and Electronics Department in 2016 and retired due to age limit in 2019. He is currently consulting and supporting projects in fiber lasers and photonics. His current interests include, nanocrystals, semiconductor materials and semiconductor lasers, waveguide optics, plasmonic cavities, high power and ultrafast fiber lasers.

**Evolution of Laser Technologies**

Interest in coherence of light and of its manifestations can be traced back to 1865 (Verdet) and later to 1907 (von Laue). However, it was Einstein who showed the way for achieving it. First the ammonia maser which earned a Nobel prize and later the invention of its cousin, the ruby laser, in 1960, opened the door to laser technologies. Many types of lasers quickly followed including the laser diode, gas, solid state and finally the fiber-based lasers, not to mention many other exotic approaches. In this talk, after a brief historical overview, current state of the art will be discussed with emphasis semiconductor lasers and their role in manipulation of light for many applications.

## Elias STATHATOS

Dr. Elias Stathatos is currently professor in Electrical and Computer Engineering Dept. of University of Peloponnese. In period 2008-2010 he was Department Head of the Electrical-Engineering Department in Technological-Educational Institute of Patras. Professor Stathatos is the head of the Nanotechnology and Advanced Materials Laboratory, and he has more than 150 publications in peer review journals and six chapters in books which are recognized of more than 7300 citations (h-factor=41). He is Principal/co-Principal Investigator in 25 funded proposals while he is a co-investigator in five patents related to solar energy conversion and solar cells. He has participated in more than 70 conferences giving several plenary and invited lectures. He is a reviewer in numerous International Journals (>40) and an editorial board member for "Journal of Advanced Oxidation Technologies", "Materials Science for Semiconductor Processing", "International Journal of Photoenergy", "Nanotechnology", "Molecules" and Section Editor in Chief "Optoelectronics" of "Electronics" Journal (MDPI). His research interests are focused in third generation solar cells and their characterization. In particular, Prof. Stathatos is interested in the conversion of solar into electrical energy using dye-sensitized, quantum dot and perovskite solar cells employing nanostructured materials. Furthermore, Prof. Stathatos is also interested to electrochromic nanocomposite materials for smart windows and luminescent solar concentrators for PV enhanced performance after spectral shift and greenhouse applications.

**All printed third generation solar cells and modules made of perovskites under ambient conditions**

Given the present research momentum, the development of efficient and stable ambient air-processed perovskite solar cells (PSCs) is of the core interests of scientists dealing with this new class of photovoltaics. The greatest progress and the most intensive research have been towards the application of perovskites as absorbers for solar energy conversion applications. In that direction, perovskite solar cells (PSCs) have achieved power conversion efficiencies (PCEs) that are now comparable with the well-established and widely applied crystalline Si solar cells. On the other hand, inkjet-printing technology is anticipated to play a major role in the future prototyping of perovskite solar cells (PSCs) to enable their ultra-low-cost and scalable manufacturing. However, inkjet challenges related to fluid dynamics need to firstly be addressed so as to allow the fabrication of high-quality printed materials and competitive photovoltaics to the established market. PSCs with earth-abundant carbon as an effective replacer for unstable hole transporting materials and expensive electrodes is a proposed structure promising better air and moisture stability. In this presentation, we will report on the latest advances of perovskites used as absorbers in carbon-based perovskite solar cells and also to their modifications for long term stability and simplicity of preparation methods (Fig.1). Some of their outstanding properties including low cost, high stability, ambient processability and compatibility with most up-scaling methods will be also discussed. The motivation for this study has been the great potential that C-PSCs have shown for the leap towards their commercialization.

## Serap GÜNEŞ

Dr. Serap GÜNEŞ is a faculty member at Yıldız Technical University, Department of Physics. After completing her undergraduate and graduate studies at Yıldız Technical University, she continued her doctoral studies at Johannes Kepler University Linz (Austria) between 2002 and 2006. She has been working as a full-time Professor at Yıldız Technical University, Department of Physics since 2014.

She was awarded by the Turkish Physical Society in 2007 with "Prof. Dr. Şevket Erk The Young Scientist Award" for her work in the field of Physics and Energy, and in 2009 she won "the Unesco Loreal Support for Women in Science Award" for her project work. Also given by the Turkish Physical Society in 2017, Prof. Dr. Serap Güneş won the "Prof. Dr. Engin Arık Scientist Award". In 2022, she was awarded by the Ministry of Energy of Turkey with "Women Energizing Turkey" prize.

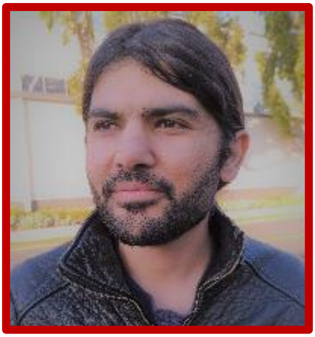
She is inventor and/or applicant in 2 registered national and 2 international patents. There are 4 patent applications under evaluation. She worked as an executive in many R&D projects funded by Tübitak. In 2022, she was entitled to be supported within the scope of Tübitak Bideb-2247-A National Leading Researchers program. She has published many scientific papers in high-ranking SCI/SCI-Expanded journals for which she received more than 8000 citations.

**Recent Developments in Emerging PV Technologies**

Solar energy is one of the most promising forms of renewable energies since it is clean, abundant and is for free. Also, solar modules, which produce electricity from sun light, are easy to maintain. Solar cells are divided into three generations (first, second and third) depending on the materials used in their fabrication. Third generation solar cells are also counted as emerging PV technologies. While the first two technologies are already on the photovoltaic market, the emerging PVs consisting of organic, hybrid, and perovskite solar cell technologies are taking firm steps on this path. The advantages of emerging PVs are cost-effective fabrication, the possibility to tune the physical and chemical properties of components, and their compatibility with flexible substrates that make these technologies stand out.

In this presentation, the recent developments in emerging PV technologies will be reviewed. The performance and stability of emerging PVs fabricated at YTU Organic Electronics Laboratory will be summarized.

## Mehmet ÖĞÜT



Dr. Mehmet Öğüt received his B.S. degree in electrical and electronics engineering from Boğaziçi University, Istanbul, Turkey (2007-2011), M.S degree in electrical engineering from the George Washington University, Washington, DC, USA (2011-2013) and Ph.D. degree in electrical engineering from Colorado State University (CSU), Fort Collins, CO, USA (2015-2018).

He is currently working at NASA/Caltech Jet Propulsion Laboratory (JPL) in Pasadena, California, USA as a technologist in Microwave Instrument Science Group. He is the CO-I and JPL lead of Ultra-Wideband Photonic Spectrometer for Planetary Boundary Layer Sensing funded under NASA Earth Science Technology Office (ESTO) Advanced Component Technology (ACT-20), the CO-I of Smart Ice Cloud Sensing (SMICES) high frequency radiometer (250-670 GHz), sounder (380 GHz) and radar (240 GHz) awarded under NASA ESTO IIP-19 and the CO-I of Compact Fire Infrared Radiance Spectral Tracker (c-FIRST) funded by NASA ESTO IIP-21. His expertise is design, testing, calibration and analysis of microwave and millimeter-wave radar/radiometer instruments, developing innovative concepts in radiometry and artificial intelligence and photonic applications in remote sensing.

**Photonic Remote Sensing**

Microwave and millimeter-wave planetary remote sensing has been an important tool to understand planet formation including but not limited to water and carbon cycle, atmosphere and cryosphere. Technological advancements have enabled us to design low-noise, ultra-wideband RF systems with much larger spectral coverage compared to conventional remote sensors that can provide critical information for science studies. However, current technology is limited for acquiring such a large bandwidth with fine acquisition. This talk focuses on the development of remote sensing instruments, current state of the art technology and the new technological developments by building photonic integrated chips for the next generation photonic remote sensing instruments. The photonic remote sensing systems will provide large bandwidth that cannot be achieved with any other current receivers while miniaturizing the size, substantially reducing the power and weight making them a strong candidate for a possible future spaceborne mission.

## Sudip SHEKHAR

Dr. Sudip Shekhar received his B.Tech. degree from the Indian Institute of Technology, Kharagpur, and the Ph.D. degree from the University of Washington, Seattle.

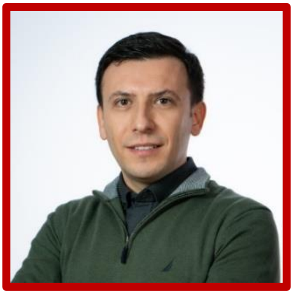
From 2008 to 2013, he was with the Circuits Research Laboratory, Intel Corporation, Hillsboro, OR, USA, where he worked on high-speed I/O architectures. He is now an Associate Professor of Electrical and Computer Engineering with The University of British Columbia, Vancouver. His current research interests include circuits for electrical and optical interfaces, frequency synthesizers, and wireless transceivers.

Dr. Shekhar was a recipient of the Young Alumni Achiever Award by IIT Kharagpur in 2019, the IEEE Transactions on Circuit and Systems Darlington Best Paper Award in 2010 and a co-recipient of IEEE Radio-Frequency IC Symposium Student Paper Award in 2015. He serves on the technical program committee of IEEE International Solid-State Circuits Conference (ISSCC), Custom Integrated Circuits Conference (CICC) and Optical Interconnects (OI) Conference.

**Scaling up silicon photonic-based accelerators: Challenges and opportunities**

Digital accelerators in the latest generation of CMOS processes support multiply, and accumulate (MAC) operations at energy efficiencies spanning 10–100 fJ/Op. However, the operating speed for such MAC operations is often limited to a few hundreds of MHz. Optical or optoelectronic MAC operations on today's silicon photonic IC platforms can be realized at a speed of tens of GHz, leading to much lower latency and higher throughput. In this talk, I will describe the integrated silicon photonic MAC circuits based on Mach–Zehnder and microring structures. I will present the bounds on energy efficiency and scaling limits for N × N MAC networks based on the optical and electrical link budget, as well as some packaging concerns related to the CMOS/photonic co-integration. I will also describe research directions that can overcome the current limitations.

## Serhat TOZBURUN



Dr. Serhat Tozburun received his B.S. degree in Physics from Middle East Technical University in 2005, an M.S. degree in Physics from Koc University in 2007, and a Ph.D. degree in the Optical Science and Engineering from the University of North Carolina, Charlotte in 2012, respectively. In his Ph.D. dissertation research, he worked on optical stimulation of cavernous nerves lying on the prostate surface, using infrared laser radiation as a potential alternative for intraoperative identification and preservation of the Cavernous nerves to conventional nerve mapping devices. After graduation, he joined the Wellman Center for Photomedicine at Massachusetts General Hospita and Harvard Medical School to participate in innovative research studies of the development of optically subsampled optical coherence tomography and a rapid, phase-stable optical coherence tomography system. At Wellman Center, he also focused on developing a method using novel apparatus for the treatment of Barrett's esophagus, which is a precancerous condition of the esophagus and associated with esophageal cancer.

Currently, he is a faculty member at Dokuz Eylul University and is appointed as the principal investigator at İzmir Biomedicine and Genome Center (IBG). At IBG, He established the Biophotonics and Optical Imaging Research Group in 2016. The broad goal of the research group is to develop and implement optical techniques and non-invasive optical coherence imaging modalities to address biomedical challenges.

Dr. Tozburun serves as a reviewer of the Journal of Biomedical Optics, Optics Express, Biomedical Optics Express, Optics Letter, Applied Optics and Current Molecular Imaging. He is a Marie Skłodowska-Curie Actions (MSCA) fellow. He is also a member of the Institute of Electrical and Electronics Engineers – IEEE, the Optica – OSA, and the International Society for Optics and Photonics – SPIE. He has been awarded a 2012 Optics and Photonics Scholarship by SPIE for his potential contributions to the fields of optics and photonics, a 2016 Eser Tumen Outstanding Achievement Award by Fevzi Akkaya scientific activities support fund (FABED), a 2018 Young Scientist Award Program (GEBIP) Grantee by Turkish Academy of Science (TUBA), and a 2020 Young Scientist Awards Program (BAGEP) Grantee by Science Academy.

**Photothermal Coagulation of the Superficial Layer of the Esophagus**

Many diseases usually begin in superficial tissues, such as the mucosal tissues of the gastrointestinal (GI) tract. These include cancers of the GI tract (e.g., esophageal cancer, colon cancer, rectal cancer) that present as precancerous mucosal lesions and then spread to deeper tissue structures. Although endoscopic therapeutic interventions efficiently eradicate superficial abnormal tissues, the main challenge with their current deployments is that the therapy depth typically has a more profound thermal injury than the target layer. This unintentional failure of possible thermal damage, coupled with multiple treatment sessions, results in organ narrowing, bleeding, or perforation. To address this challenge, an approach that provides a limited depth of the thermal effect to the epithelial layer (~500 µm thick), particularly at the micrometer scale, may be of interest. The talk presents two ongoing approaches to superficial coagulation in our research lab. One of these approaches is to develop a new fiber probe, and the other is to develop a guide map of the area of irreversible thermal damage at a well-confined depth. Besides, the talk discusses the performance of these approaches in an ex vivo tissue model.

## Wim BOGAERTS

Dr. Wim Bogaerts is a professor in the Photonics Research Group at Ghent University and the IMEC nanotechnology research center in Belgium. He completed his PhD in 2004, pioneering the use of industrial CMOS fabrication tools to build photonic circuits. Between 2000 and 2010, he was the driver behind the buildup of IMEC's silicon photonics technology. In parallel, he started developing design automation tools to implement complex silicon photonic circuits. In 2014, he co-founded Luceda Photonics, bringing the design tool IPKISS to the market. Since 2016 he is back full-time at Ghent University and IMEC on research grant of the European Research Council, focuses on the challenges for large-scale photonic circuits and the new field of programmable photonics. He is an IEEE Fellow, and senior member of OSA and SPIE.

**Programmable Photonic Chips**

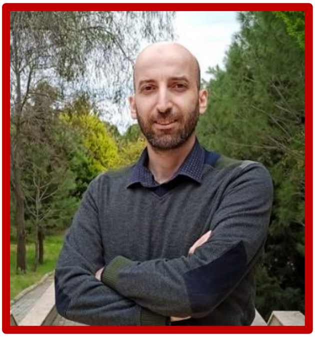
Programmable photonic circuits are chips that manipulate light, and whose functionality can be configured through a layer of electronics and software. This is in stark contrast with most photonic chips today, which are custom-designed and built for one application, and therefore costly to develop. Programmability on a photonic chip means that the functionality can be adjusted, or in some cases completely synthesized at run time, similar as with digital electronics where we find field-programmable gate arrays (FPGA) or digital signal processors (DSP). We will discuss the basic photonic technology blocks for programmable photonic circuits, and the technological layers around these chips to make them programmable. The programmability in itself significantly lowers the threshold to experiment with photonic circuits, and could accelerate adoption and application developments, eventually putting photonic chips in the hands of the maker community.

## Richard ZELTNER

Dr. Richard Zeltner is a project leader and executive assistant at the German laser manufacturer Menlo Systems GmbH, and a member of the 2022 Class of Optica Ambassadors. Before joining Menlo in 2019 he worked as a researcher at the Max Planck Institute for the Science of Light in Erlangen, Germany. His PhD project evolved around optical trapping inside hollow-core photonic crystal fiber, with a particular focus on developing novel optical sensors based on optically propelled microparticles.

**Sensing using optically trapped micro particles**

Since the pioneering work of Arthur Ashkin optical traps have been developed into an indispensable tool for various areas of research and technology. Yet in free-space trap configurations, e.g., optical tweezers or dual-beam traps, the accessible manipulation range is fundamentally limited by diffraction or the field of view of the employed optics. A possible approach to overcome this dilemma is to employ the guided modes of optical waveguides for trapping. The well-defined core modes of hollow-core photonic crystal fiber (HC-PCF) makes them particularly suited for trapping applications. This talk will introduce HC-PCF as a platform for optical trapping in general and will discuss in detail how optically trapped microparticles inside HC-PCF can be used for sensing applications.



## Hasan GÖKTAŞ

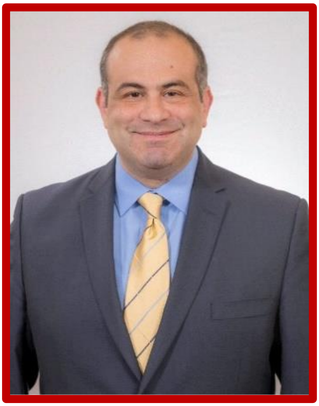
Dr. Hasan Göktaş received the B.S. degree in mechanical engineering from the Izmir Institute of Technology in 2006, the M.S. degree in electrical engineering, and the Ph.D. degree in computer engineering from The George Washington University, in 2010 and 2015, respectively. He joined the department of Photonics at the Izmir Institute of Technology in 2021 and continue to serve as IEEE Photonics and SSCS Turkey Chapter Chair. Prior to his faculty position, he worked as postdoctoral researcher in photonics lab in The George Washington University.

Dr. Göktaş's research interest is in MEMS/NEMS, Photonic-MEMS and Programmable Photonic Integrated Circuit. He is inventor in 1 registered national patent on MEMS/NEMS, while having another 3 patent applications in progress on MEMS/NEMS and co-inventor in another US patent application on Photonic Devices.

**Photonic-MEMS for Programmable Photonic Integrated Circuits**

The Photonic Integrated Circuits (PIC) enables high speed computing in comparison to cutting-edge GPU technology especially for deep learning and AI applications. There are few different ways to convert PIC to programmable PIC so that one can build any type of circuit on the same chip via software. This would prevent too much fabrication cost and time while bringing flexibility in the design environment. In contrast to thermo-optic, optomechanical, plasma dispersion and electro-optic, MEMS enables very low power consumption with a decent optical loss. That's why Photonic-MEMS is getting very popular in building cutting edge programmable PIC. In this talk, we will first start with the tuning mechanism in photonic devices via MEMS. Later, we will discuss different types of Photonic-MEMS devices and how they were implemented to not only to build switches, and phase shifters but also convert photonic devices into tunable couplers and grating couplers.

## Amr S. HELMY



Dr. Amr S. Helmy is a professor in the department of electrical and computer engineering at the University of Toronto. Prior to his academic career, Amr held a position at Agilent Technologies - UK, between 2000 and 2004. At Agilent his responsibilities included developing lasers and monolithically integrated optoelectronic circuits. He received his Ph.D. and M.Sc. from the University of Glasgow with a focus on photonic fabrication technologies, in 1999 and 1994 respectively. He received his B.Sc. from Cairo University in 1993, in electronics and telecommunications engineering science.
His research interests include photonic device physics and characterization techniques, with emphasis on plasmonics, nonlinear and quantum photonics.

**Efficient Plasmonic Circuits for Data Communications**

In this talk we plan to discuss a novel class of nanoscale devices that address unmet performance demands for applications in data communications. The performance of emerging generations of high-speed, integrated electronic circuits is increasingly dictated by interconnect density and latency as well as by power consumption. To alleviate these limitations, data communications using photons has been deployed, where photonic circuits and devices are integrated on platforms compatible with conventional electronic technologies. Within the dominant platform, namely Si, dielectric waveguides confine light via total internal reflection. This imposes bounds on minimizing device dimensions and density of integration. Those bounds arise due to the diffraction limit and the cross-coupling between neighboring waveguides. Nanoscale Plasmonic waveguides provide the unique ability to confine light within a few 10s of nanometers and allow for near perfect transmission through sharp bends as well as efficient light distribution between orthogonally intersecting junctions. With these structures as a building block, new levels of optoelectronic integration and performance metrics for athermal transceivers with achievable bandwidths of 100s Gbps and detection sensitivity better than -55 dBs, will be overviewed in this talk. In addition, opportunities for the role that 2D materials may pay in propelling these record performance metrics even further will be projected.

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# IZPHOTECH 2022 TEAM

**Prof. Dr. Canan VARLIKLI**
**Head of IZTECH Department of Photonics**
**Advisor of IZTECH Optics and Photonics Society**

**Assoc. Prof. Dr. Hasan GÖKTAŞ**
**President of IEEE Photonics Society Turkey Chapter**

**Umut Baran GÜNDÜZ**
**President of IZTECH Optics and Photonics Society**

**Zeynep SAATCI**
**Former President of IEEE Photonics IZTECH Student Chapter**

**Yiğit GÜVEN**
**President of IEEE Photonics IZTECH Student Chapter**

**Res. Asst. Metin TAN**
**Vice-President & Secretary of IEEE Photonics Society Turkey Chapter**

**Res. Asst. Hakan BOZKURT**
**IZTECH Optics and Photonics Society Member**