
## MEMS & Imaging Summit

### Welcome Remarks

L. Altimime
President
SEMI Europe, Berlin, Germany

**Abstract**
Coming Soon

**Biography**
Laith Altimime, as President of SEMI Europe, leads SEMI's activities in Europe and the Middle East and Africa (EMEA). Altimime has P&L responsibility as well as ownership of all Europe region programs and events, including SEMICON Europa. He is responsible for establishing industry standards, advocacy, community development, expositions, and programs. He provides support and services to SEMI members worldwide that have supply chain interests in Europe. He manages and nurtures relationships with SEMI members in the region and globally as well as with local associations and constituents in industry, government, and academia. Altimime has more than 30 years of international experience in the semiconductor industry. Prior to joining SEMI in 2015, He held senior leadership positions at NEC, KLA-Tencor, Infineon, Qimonda and imec. Altimime holds an MSc from Heriot-Watt University, Scotland.

References

## Smart Sensors for Smart Life – How Advanced Sensor Technologies Enable Life-Changing Use Cases

S. Finkbeiner
CEO
Bosch Sensortec, BST/GM, Reutlingen-Kusterdingen, Germany

**Abstract**
Smart and tiny sensors are catalysts for addressing major modern challenges like enhancing environmental health and elevating human well-being.

The rapid development of hearables and wearables promise entirely new fields of applications improving the user's well-being and lifestyle by integrating many different functions in multiple connected devices. MEMS sensors play a crucial role in the realization of such innovative devices. The presentation shows how cutting-edge sensor technology enables innovative devices for advanced use-cases. There will be a special focus on connected devices and the extended usage of algorithms on the sensor which enable even more complex applications. This leads to completely new use-cases such as full-body motion tracking, indoor navigation and air quality tracking.

The examples underscore the synergy between MEMS sensors and smart algorithms, unlocking vast potential across diverse fields. The presentation concludes with an outlook on innovative use cases ahead.

**Biography**
Dr. Stefan Finkbeiner has been CEO and General Manager at Bosch Sensortec GmbH since 2012.

In 2015, Dr. Finkbeiner was awarded with the prestigious lifetime achievement award from the MEMS & Sensors Industry Group. In 2016, 2022 and 2023 Dr. Finkbeiner has been elected Manager of the Year by the Markt & Technik Magazine.

He joined Robert Bosch GmbH in 1995 and has been working in different positions related to the research, development, manufacturing, and marketing of sensors for more than 20 years. Senior positions at Bosch have included Director of Marketing for sensors, Director of Corporate Research in microsystems technology, and Vice President of Engineering for sensors.

Dr. Stefan Finkbeiner received his Diploma in Physics from University of Karlsruhe in 1992. He then studied at the Max-Planck-Institute in Stuttgart and there received his PhD in Physics in 1995. He was born in 1966 in Freudenstadt, Germany.

References

# Sensing the World: Innovating for a More Sustainable Future

S. Ferri
APMS Group Vice-President, MEMS sub-group
General Manager
STMicroelectronics, Agrate Brianza, Italy

**Abstract**
Sensors are at the core of many of our interactions with the world. They serve as the bridge between the physical and digital realms. From this perspective, there is a strong expectation that sensorization remains human-centric, enhancing our daily lives by contributing to a better lifestyle. Also, there is an increasing urgency to keep up with long-term plans regarding sustainability. The path for a net-zero transition is everyone's responsibility, and embedding sustainability practices in our sensor strategy is essential to our people, our business, and society at large. Our commitment to sustainability is reflected in the way our sensors deliver valuable data efficiently across various industries, including automotive, industrial sectors, infrastructure projects, and consumer electronics, ensuring that our technological footprint is both meaningful and environmentally conscious.

**Biography**
Simone Ferri is General Manager for STMicroelectronics MEMS sub-group since February 2016.
Simone began his career in STMicroelectronics in 1999 as an R&D engineer, before moving on to digital designer for the Audio Division, leading into product management after 5 years. In 2014, Simone was entrusted with ST MEMS consumer sensors then with global MEMS-sensor related Marketing and Application activities across all markets and segments, and, more recently with AMS Group Vice-President and General Manager of the MEMS sub-group
Simone Ferri was born in Milan in 1972 and graduated with a degree in Microelectronics from the Polytechnic of Milan, where he also completed his MBA.

References

## A Paradigm Shift From Imaging to Vision: Oculi Enables 600x Reduction in Latency-Energy Factor for Visual Edge Applications

C. Rizk
Founder CEO
Oculi, Rochester, United States of America

**Abstract**
Remarkable progress has been achieved in AI, particularly in the use of deep neural networks, which has significantly enhanced the reliability of face detection, eye / hand tracking, & people detection. However, performing these tasks still demands substantial computational power & memory resources, making it a resource-intensive endeavor that remains to be solved. Consequently, power consumption & latency pose significant challenges for many systems operating in always-on edge applications.
The OCULI SPUTM (Sensing & Processing Unit), ideal for smart vision applications, represents an intelligent, programmable vision sensor capable of configuration dynamically to output select data in various modes depending on use case needs. These modes include video, polarity events, smart events, regions of interest (ROI), sparse random access, & actionable information that make the vision sensor efficient. Moreover, the SPU allows real-time programmability of spatial & temporal resolution, as well as dynamic range & bit depth. By enabling continuous optimization, visual AI solutions deploying the SPU can reduce the latency-energy factor by more than 600x at a fraction of the cost. Smart events, ROI, random access, & actionable information output modes are unique to the OCULI SPU.
Because the SPU is fully programmable, it can be dynamically optimized between latency & power consumption. It will enable the first truly wireless battery-operated always-on Visual AI products in the market. We will provide an overview of Oculi's novel vision architecture for edge applications, as well as key results for latency & energy results for multiple use cases of interest. Applicability to various markets including presence/people/pedestrian/object, face, hand, & eye detection will be reviewed. Finally, our results include a comparison with conventional solutions that demonstrate significant advantages in adopting a paradigm shift from imaging to vision for visual edge applications.

**Biography**
Charbel is Founder and CEO of Oculi.
Prior to this venture, Charbel was an Associate Research Professor at Johns Hopkins University, where he was recognized as a top innovator, thought leader, and successful Principal Investigator of multiple innovative and far-reaching concepts and technologies.
He has had numerous publications and intellectual property filings, and received 12 achievement/recognition awards.

Dr. Rizk was a pioneer in UAV technology, AI & machine learning, and autonomy. He has been a visionary for the optimized signal-to-information architecture that embodies dynamic software-defined multi-modal sensing and fusion and true edge processing.

References

P. D. Berger
MEMS Industrial Partnerships Manager
CEA LETI, DCOS - Components on Silicon Division,
Grenoble, France

**Biography**
session chair

References

# Unlocking Novel Opportunities:How 300mm-capable MEMS Foundries will Change the Game

J. Gomez
CEO
Rogue Valley Microdevices, Medford, United States of America

**Abstract**
Although the semiconductor industry began manufacturing on 300mm wafers in the early 2000s, benefiting from economies of scale, design standards, and standardized process nodes, the MEMS industry has lagged. In MEMS, it's still a single product, single process world – making it time-consuming and expensive to bring new devices to market. As the number of 300mm CMOS fabs continue to increase, so does the demand for 300mm-capable MEMS foundries to support critical technology integration, scalability, and efficiency.

For the MEMS industry, the adoption of 300mm wafers will signify a substantial leap forward in manufacturing automation and cost-effectiveness, yet it still presents many challenges. MEMS processing frequently utilizes non-CMOS compatible materials for metallization, sensing and actuation, making it nearly impossible to support both CMOS and MEMS manufacturing in the same facility. To be successful on a 300mm platform, MEMS foundries will need to manufacture a high mix of products to ensure their facilities run efficiently and at capacity.

This session will explore how Rogue Valley Microdevices – a pureplay, full-service precision MEMS foundry – has reacted to this need for 300mm MEMS with the construction of its second fab, a flexible, 300mm-capable MEMS foundry in Palm Bay, Florida with production set to begin in 2025. Rogue Valley Microdevices expects to address multiple areas of need, including thin film deposition, through-silicon via (TSV), RDL, UBM, wafer level packaging, and is poised to leverage 300mm technology to propel MEMS sensor development to unprecedented heights.

Join us as we explore how flexible, 300mm-capable MEMS foundries promise to revolutionize the integration of microsensors into the supply chain, fostering innovation and unlocking new possibilities for transformative products.

**Biography**
As founder and CEO of Rogue Valley Microdevices, Jessica Gomez has created a world-class precision MEMS foundry in the heart of Southern Oregon, with a second foundry under construction in Palm Bay, Florida. Integral to her role as CEO, Ms. Gomez practices a business philosophy of offering best-in-class process technology and R&D expertise to customers, to help them achieve the highest quality and reliability in their products. Prior to founding Rogue Valley Microdevices in 2003, Ms. Gomez honed her experience in semiconductor processing and production management through positions at Standard Microsystems Corporation, Integrated Micromachines, and Xponent Photonics.
Ms. Gomez plays an active leadership role within and beyond the technology industry. She is a board member of the prestigious SEMI Board of Industry Leaders, and she is the first executive selected for Spotlight on SEMI Women, which honors accomplished women in the global microelectronics industry.

References

# Trends in Emerging MEMS

A. Fitzgerald
CEO
A.M. Fitzgerald & Associates, LLC, Burlingame,
United States of America


**Abstract**
End uses for MEMS are expanding into new areas beyond consumer electronics. These include ADAS and autonomous piloting systems, microfluidics for genomic analysis, portable ultrasonic devices, metaverse applications, and environmental monitoring.

In view of these increasingly demanding MEMS applications for which high precision, robustness and small size are essential, new device architectures are emerging, particularly the use of piezoelectric thin films.

Drawing from her company's product development work, as well as from her view of current trends in MEMS and sensor R&D, Dr. Fitzgerald will provide a perspective on emerging MEMS architectures and materials for near-term business and growth opportunities.

**Biography**
Alissa M. Fitzgerald, PhD, has 30+ years of experience in MEMS design, fabrication methods, multiphysics simulation, and product development. She has personally developed over a dozen distinct MEMS devices such as piezoresistive cantilevers, pressure sensors, ultrasound transducers, and infrared imaging arrays, and she holds 11 US patents.

Dr. Fitzgerald advises clients on the entire cycle of microelectronic product development, from business and IP strategy to supply chain and manufacturing operations. In addition to her primary focus on industrial and commercial activities, she continues to engage in collaborative scientific research, serve on academic conference abstract review committees, participate in peer reviewed academic journal articles, and offer guest lectures at academic institutions such as UC Berkeley and Stanford University.

Dr. Fitzgerald is a member of the SEMI-MSIG Standards Committee and served as a board director on the MEMS Industry Group (MIG) Governing Council from 2008-2014. In 2013, she was inducted into the MIG Hall of Fame. She serves as a board director for Rigetti Computing (NASDAQ:RGTI), a full stack quantum computing company. Dr. Fitzgerald received her bachelor's and master's degrees from MIT and her PhD from Stanford University in Aeronautics and Astronautics.

References

# The Most Common Antistiction Films are PFAS, Now What?

D. Springer
Product Manager, MVD and Release Etch Products
KLA Corporation, SPTS Division, Allentown, United States of America

**Abstract**
Antistiction coatings are widely used in MEMS applications to improve device performance and enhance overall device lifetime. The most widely used chemicals are fluoropolymers like FDTS and FOTS, which are members of the large group of PFAS substances. MEMS integrators and manufacturers are increasingly seeking alternative antistiction coatings that do not use PFAS chemicals. The obvious solutions include hydrocarbon analogs of FDTS and FOTS, but these don't have the required thermal or mechanical stability. This talk will discuss the various alternatives to FDTS, explore their strengths and weaknesses, and introduce a new proprietary fluorine free antistiction coating.

**Biography**
David Springer is a Product Manager at KLA in charge of MEMS applications of MVD coatings, and $XeF_2$ release etch products. He joined SPTS in June of 2013 when SPTS acquired Xactix Inc. where he was President for 11 years. Previous to XACTIX, David was president of a design automation startup company and received his PhD. in Computer Engineering from Carnegie Mellon University.

References

## Latest innovations in MEMS wafer bonding

T. Uhrmann
Director Business Development
EV Group, St. Florian am Inn, Austria


**Abstract**
MEMS and sensors play a crucial role in many of today´s applications. As their complexity and integration continues to increase, innovative manufacturing technologies become essential to fulfil the requirements of next-generation applications. Wafer bonding is a key technology for MEMS and sensors encapsulation but also for advances in system integration. This presentation will discuss the latest developments in high-vacuum oxide-free wafer bonding, a technology that enables not only conductive bond interfaces but is also well suited for heterogenous material integration at low- or even room-temperature. In addition, recent innovations in high-volume 300 mm MEMS wafer bonding will be highlighted in this talk.

**Biography**
Dr. Thomas Uhrmann is director of business development at EV Group (EVG) where he is responsible for overseeing all aspects of EVG's worldwide business development. Specifically, he is focused on 3D integration, MEMS, LEDs and a number of emerging markets. Prior to this role, Uhrmann was business development manager for 3D and Advanced Packaging as well as Compound Semiconductors and Si-based Power Devices at EV Group. He holds an engineering degree in mechatronics from the University of Applied Sciences in Regensburg and a PhD in semiconductor physics from Vienna University of Technology.

References

D. Damianos
Project Manager
Yole Group, VILLEURBANNE, France


**Biography**
Dimitrios Damianos, Ph.D., is a Project Manager in the Consulting Services Division at Yole Group. He manages transverse consulting projects, ensuring their quality and maintaining long term relationships with key accounts.
Dimitrios also plays a key role in the expansion of Yole's market & technical knowledge and supports the development of strategic projects following the company's leading customers within the semiconductor industry.
He holds a BSc in Physics and MSc in Photonics, both from the University of Patras (GR), as well as a PhD. in optics & microelectronics from the University of Grenoble-Alpes (FR).

References

# Unlocking Infrared Multispectral Imaging with Pixelated Metasurface Technology

C. Altuzarra
Chief Executive Officer and Cofounder
Metahelios, Glasgow, United Kingdom


**Abstract**
All camera sensors made to take pictures in color require the integration of color filter arrays (CFAs). However, CFA technology has a fatal flaw, they are not made to filter light in the infrared range, in particular in the shortwave infrared (SWIR) range specific to InGaAs and QD sensors. However, obtaining spectral information in the SWIR range is crucial across almost all industries including consumer, earth observation, national security/defense and automotive.
In this presentation, we introduce Metahelios' Infrared filter arrays (IFAs) developed with our signature pixelated metasurface technology. More to that, we discuss the implied opportunities for applications of compact SWIR multispectral cameras that require no moving parts.

**Biography**
Dr. Charles Altuzarra graduated from the Nanyang Technological University (NTU) with a PhD in physics with a focus on experimental quantum optics and metamaterials. During that time he was a researcher under the CNRS/Thales/NTU alliance. He then held positions at Heriot-Watt University, Texas A&M University's Institute for Quantum Science & Engineering (position funded by the Air Force Office of Scientific Research), and University of Glasgow in Scotland. He then cofounded Metahelios with his business partner Dr. Yash Shah in 2022. Metahelios develops cutting-edge pixelated metasurface technology for the consumer, defense and space industries.

References

# Electrically Tunable Dual-Band VIS/SWIR Imaging and Sensing

A. Ballabio
CEO
EYE4NIR, Milano, Italy


**Abstract**
Short-wave infrared (SWIR) imaging and sensing sees an increase in commercial interest, given the wide range of use cases that are possible to implement, from automotive, to industrial automation, agri-food and many more. Silicon has an absorption cut-off at 1100nm in wavelength, therefore to detect SWIR other materials are needed. Germanium given its direct band gap of 0,8eV is a suitable material to be used to detect SWIR, however to exploit lower cost and potential scalability, epitaxial Ge-on-Si is considered to be used in devices. Ge-on-Si photodiodes have been firstly reported more than twenty years ago opening the way for the integration of IR photodetectors on Si. A tremendous development has been done, moving from vertically illuminated, stand-alone devices, to waveguide integrated arrays of photodetectors and CMOS integrated imagers. Usually, the Ge epilayer act as the absorbing material for the SWIR radiation, while Si acts only as a substrate. Here we report on a dual-band Ge-on-Si photodetector where light detection can take place both within the Ge epilayer and the underlying Si substrate: the device responsivity can thus be tuned from the VIS to the SWIR spectral range by means of an external bias. This principle of operation has been transferred into a CMOS process in order to fabricate CMOS image sensor, capable of detecting selectively visible and SWIR light. Sensing applications are also where the device was used to discriminate among different chemicals and plastics by exploiting the device spectral response in the two bands and the specific absorption spectra of the materials.

**Biography**
Andrea Ballabio graduated cum Laude in M. Sc. in Material Sciences (2014) at the University of Milano-Bicocca. He received his Ph.D. in Physics cum Laude (2018) from Politecnico di Milano working on optoelectronic and photonic applications. He as been a post-doc fellow at the Politecnico di Milano working on the growth and morphological characterization of germanium single-photon devices for SWIR applications. In 2021 co-founded EYE4NIR, where he is currently the CEO, with the aim to develop Ge based SWIR image sensors for the automotive and industrial markets.

References

# FMCW Chip-Scale LiDARs Scales Up for Large Volume Markets thanks to Silicon Photonics Technology

S. François
CEO
SteerLight, GRENOBLE cedex 09, France

**Abstract**
LiDAR sensors are key for safe mobility and in particular for automated and autonomous robots, machines and vehicles to detect obstacles. However, today's commercial LiDAR technologies cannot face the issues of a widespread adoption in terms of costs, reliability and form factors. Steerlight, a CEA-Leti spin-off, develops a third generation of LiDARs on-chip combining at chip-scale level FMCW detection scheme and non-mechanical beam steering thanks to Silicon Photonics. FMCW provides instantaneous depth and velocity information while Silicon Photonics allows a system on-chip integration of the optical and electronics functionalities.
This miniature and scalable LiDAR enables high reliability, compactness, cost reduction with high resolution/range performance. These features are 'must have' for a mass adoption by the growing markets of automotive and robotics. More generally, such new sensor will empower the use of 3D vision for a wide range of applications such as smart cities, services, homes or even consumer electronics.

**Biography**
Dr François Simoens is the CEO and the co-founder of SteerLight, a deeptech start-up founded in July 2022 with the ambition to provide smarter 3D vision with a new generation of miniaturized FMCW silicon-photonics based LiDAR sensors. He builds this disruptive value proposition on his prior involvement in photonics developments for more than 25 years. He joined CEA-Leti in 2003 to contribute to R&D institutional and industrial project before taking the position of program manager and expert in the imaging sensor field. During the 15 last years, he has been acting as Business Developer for industrial partnerships and Marketing Manager for the strategic imaging domain.

References

# ShadowChrome: a Novel Approach to an Old Problem

G. Rhoads
Chief Technology Officer
Transformative Optics Corporation, Portland,
United States of America

**Abstract**
Creating lighting for adequate detection is a primordial problem of imaging. We can trace this struggle to the late 1800s, where solutions began with the flash lamp- an explosive comprised of flash powder and ignition. After 30 years, it was replaced by oxygen and electricity. Harnessing electricity became more efficient, bulbs became reusable, and eventually LED flashes became standard. After over a century of improving lighting, we need a new approach to the problem: how do we maintain image quality regardless of lighting? Hardware solutions have increased Bayer pattern sensors' sensitivity, but maintaining high dynamic range detail in low light remains an issue. The ShadowChrome (SC) ISP is a new approach, built to optimize the performance of every individual sensor. The algorithm exists in two parts. First, we define a standard image set highlighting the nonlinearity of mean pixel values at low SNRs. These are collected and processed with the ShadowChromeProfile (SCP) algorithm, which produces a file (SCProfile) containing information on the noise-floor of the sensor. Second, the SC algorithm leverages SCProfile to intelligently accumulate signal, converging to a lower correlated noise-floor. The result is empirically verified to increase the bit depth of images. SC is suitable for a webservice, on-device processing, or in imaging or video pipelines where raw data is accessible. Visual and performance results, along with partner testimonials show dramatic increase in dynamic range (typically 20dB-30dB), visually sharper details, truer color, and overall reduced noise. With the implementation of ShadowChrome, any camera can continue to produce detailed, high-quality images regardless of lighting- from high dynamic range scenery to nighttime lighting conditions. Beyond our early adopters in live content streaming, we are actively pursuing implementation in CMOS manufacturing, immersive experiences, endoscopic imaging systems, security and more.

**Biography**
Transformative Optics Corporation (TOC) was founded on the goal of capturing every detail. TOC began with ai-CMOS, a 9-color channel CFA pattern. Sensors with this pattern capture twice as much light, richer feature vectors, and superior color discrimination. ShadowChrome (SC) ISP originated in the development of algorithms supporting ai-CMOS increasing the color channel information. Upon studying SC’s ability to pull detail from dim and low dynamic range imagery, SC was birthed to support standard Bayer pattern sensors. TOC enhances the hardware elements as well, with the Integrated Imaging Modules (IIMs) and Array Cameras. The IIMs are integrated lens and sensor units reducing cost per pixel while increasing image quality. Array Cameras configure solutions of multiple IIMs with specialized data processing algorithms that provide super resolution while maintaining high frames per second. TOC remains focused on advancing these solutions and driving innovation to capture every detail.

References

## Feasibility Investigation of Spherically bent Image Sensors

A. Pandey
PhD Student
Technische Hochschule Ingolstadt, Ingolstadt,
Germany

**Abstract**

Due to increasing active safety requirements from tests like NCAP, it is expected that all newly registered vehicles will soon have at least two cameras, with medium to higher-end vehicles having four. With 80 million new vehicles worldwide annually, this creates a high demand for cameras, which, due to volume, has a high potential for cost reductions. Since the most expensive component in a camera is its objective, it raises the question of whether its complexity can be reduced. This work investigates a curved imager to reduce the number of elements in the objective by eliminating the need to form a planar image.

The long-term goal is to attach the imager to the last optical surface, either with a recess in the element to attach bond wires or using a Through-Silicon Via approach. This work presents an intermediate step, where a commercially available imager is thinned and bonded into a curved pedestal, detached from the objective as in established camera designs.

The design was first evaluated using silicon chips with thicknesses of 30 and 50 µm. BK7 glass was used as the pedestal's material, into which a 60mm concave radius was ground. Various liquid adhesives were investigated to bond the chip into the curvature. During assembly, the top side of the chip was vacuum sucked onto a convex 60mm radius tool, adhesive was applied, and the chip was pressed into the pedestal's depression. While remaining in place, the adhesive was cured at 150°C for 15 minutes. The assembly process impact was investigated by measuring induced stress via Raman spectroscopy and bonding quality via scanning acoustic microscopy (SAM). SAM investigation showed that the interconnect with the adhesive was inhomogeneous because of non-uniform adhesive dispensing and pressure application. Therefore, the approach was modified by investigating various adhesive volumes and dispensing patterns. After bonding, high compressive stress concentrations were seen at the center of the edges.

In the next step, thinned imagers were bonded to pedestals and to PCBs. Electrical connections were realized by 25 µm wire bonds. After the assembly, it was possible to read register values from the imager, but capturing an image was not feasible. The reason for this was hypothesized to be damage to the imager during thinning. The hypothesis was supported by results from accelerated thermal aging, where cracks appeared after 100 cycles. Work is in progress to achieve a fully functional imager.

**Biography**

Amit Pandey received a B. Tech degree in Mechanical Engineering from SRM University in India and an M. Eng. degree in Automotive Engineering from University of Applied Sciences in Ingolstadt. He is a researcher at the Institute of Innovative Mobility affiliated with Technische Hochschule in Ingolstadt, Germany. He is currently a PhD student at the University of Applied Sciences in Ingolstadt and his current research topics are reliabilty of optical sensors in automotive industry and the effect of aging on automotive camera and its impact on performance on critical tasks such as object detection.

References

**Intelligence through Vision**

S. Goossens
CTO
Qurv, Castelldefels, Spain

**Abstract**
Computer vision (CV) enables machines and their users to interpret and understand the world around them, making them more intelligent. Current CV systems face limitations under adverse weather or light and struggle to capture more information than a human already sees. Wide-spectrum image sensor technology overcomes these challenges by providing eye-safe active illumination without sunlight interference, offering the ability to penetrate through fog or smoke, and enabling molecular imaging. Quantum dot (QD) based technology is an attractive candidate for high-volume manufacturing of affordable and RoHS-compliant wide-spectrum image sensors. Qurv presents its latest QD-based wide-spectrum image sensor developments, focusing on scalability and computer vision-first use cases.

**Biography**
Dr. Stijn Goossens is CTO of Qurv and a pioneer in wide-spectrum image sensor technologies based on quantum materials such as colloidal quantum dots. He is inventor of multiple patents in qurv's portfolio. He obtained his PhD from Delft University of Technology and continued his career as a team lead at the Institute of Photonic Sciences (ICFO). In 2020, he co-founded Qurv as a spin-out of ICFO to develop and commercialize wide-spectrum image sensor technology for high volume computer vision applications.

References

**Next Generation Quantum Dot SWIR Sensors**

A. Shulga
CEO & Founder
QDI systems, Groningen, Netherlands


**Abstract**
Short-wave infrared (SWIR) image sensors play an important role in various defence and security applications, including low-light-level imaging, laser detection and range finding. Pixelated detectors made of indium gallium arsenide (InGaAs) have shown excellent performance for SWIR imaging, however, the cost remains the major barrier for adaptation. In this talk we will present a low-cost, next-generation SWIR sensor. We have developed an alternative technology which relies on lead sulfide quantum dot (PbS QD) photon absorber, which is monolithically and directly deposited on a CMOS readout chip via solution-based process. The uncooled sensor achieves the QE of >20% at 1550 nm with the dark current of 50 nA/cm2. Additionally, the sensitivity range can be extended further to 2.1 um. The technology is suitable for wafer-level manufacturing, thus driving the sensor cost more than an order of magnitude lower. We will present a comprehensive characterization of QD-based imager and demonstrate real-life use cases.

**Biography**
Dr. Artem Shulga was born in 1988, in the Lugansk region in Ukraine. He completed his Bachelor degree in Applied Physics at the National University of Kyiv. He spent a year working as a Research Engineer in Chernobyl NPP.
In 2011, he decided to move to Groningen to complete his Master's degree in Nanoscience. In the same year, he joined the Photophysics and Optoelectronics group, in order to work on colloidal quantum dots in field-effect transistors.

Artem defended his PhD thesis, dedicated to the engineering of devices based on quantum dots in 2019. His dissertation, entitled 'Colloidal Quantum Dot Field-Effect Transistors - From Electronic Circuits to Light Emission and Detection' was awarded with the 'Best GEC PhD Thesis Award'. Inspired by a trip to Japan a few years earlier, Artem started the company QDI systems B.V. in 2019.

With his strong background in semiconductor electronics and know-how of the fabrication of optoelectronic devices based on QDs, Artem's ambition is to continue running a successful company and to commercialise the discoveries he's made throughout his extensive research.

References

## Topic Coming Soon

A. Bakal
CEO & Co-founder
TriEye, Tel Aviv, Israel


**Abstract**
Coming Soon

**Biography**
Coming Soon

References

# Active Hyperspectral Imaging Using Extremely Fast Tunable SWIR Light Source

J. Soukkamaki
Lead, Hyperspectral & Imaging Technologies
VTT Technical Research Centre of Finland Ltd,
Oulu, Finland


**Abstract**
VTT has created an active hyperspectral imaging concept using spectrally tunable light source based on MEMS Fabry-Perot interferometer and supercontinuum laser. The proposed solution opens new possibilities in close and long range distances enabling detection even in the total darkness. Especially in the industrial lines, this new technology may enable hyperspectral market expansion from niche to machine vision mainstream.

**Biography**
Jussi Soukkamäki has over 20 years of experience in optoelectronics industry. During the last 12 years he has worked with spectroscopical applications in various positions from R&D to sales and business development in companies like Rikola Ltd, Senop, Timegate Instruments and Spectral Imaging Ltd. (SPECIM). Currently he works as a Lead, hyperspectral and imaging technologies, at VTT.

References

# Shaping the Future of Mobile Cameras: Miniaturized Multispectral Imaging for Next-Gen Applications

J. Borremans
CTO
Spectricity, Mechelen, Belgium

**Abstract**
Mobile phone cameras have rapidly evolved from basic imaging tools to sophisticated devices capable of capturing stunning, high-quality images. The addition of advanced features, such as 3D imaging, has further extended their functionality, enabling technologies like face ID and augmented reality, which, in turn, pave the way for next-generation applications. These advancements are made possible by the seamless integration of sophisticated hardware with cutting-edge software, including AI and advanced image processing algorithms, pushing the boundaries of mobile camera capabilities.
At the forefront of this technological revolution is Spectricity, which has developed ultra-miniaturized CMOS multispectral cameras based on integrated, pixelated spectral filters. These cameras deliver exceptional spectral and spatial resolution while maintaining a compact form factor and video capability, making them perfect for integration into mobile devices. By utilizing standard CMOS foundries for fabrication, Spectricity ensures scalability and cost-effective production, making these innovations accessible for widespread use.
The key innovation of these cameras lies in their ability to capture the spectral signature of a scene, providing detailed information beyond the capabilities of conventional RGB sensors. This opens the door to a wide range of applications that were previously unattainable with traditional imaging technologies.
Multispectral cameras enhance color accuracy and white balancing, resulting in more realistic images and videos. In the cosmetics industry, these cameras can precisely assess skin tones, enabling personalized product recommendations. In healthcare, they offer the potential for early diagnosis by detecting subtle changes in skin or tissue that are invisible to the naked eye. Furthermore, this technology unlocks new possibilities in smart agriculture, industrial sorting, and process monitoring.
In this presentation, we will introduce Spectricity's innovative products and delve into the diverse applications they enable across various industries. Spectricity is driving the next generation of imaging solutions for mobile and industrial use cases, setting new standards for the future of imaging technology.

**Biography**
Jonathan Borremans earned his PhD in Electronic Engineering from imec in 2004. With extensive leadership experience in wireless, MEMS, and imaging projects, he notably led imec's specialty image sensor group as Program Manager and Head of the design group. In 2018, Jonathan founded Spectricity, where he now serves as CTO, driving innovation in miniaturized multispectral image sensors for consumer applications. He also serves as a board member of Flanders Semiconductors, contributing to the advancement and future of semiconductor technology in the region.

References

# Technologies and Embedded Intelligence develoments for Future Smart Vision Systems

P. Castelein
Parternship manager
Univ. Grenoble Alpes, CEA, Leti, F-38000
Grenoble, France, Grenoble, France

**Abstract**
Coming Soon

**Biography**
Pierre Castelein obtained his engineering degree in electronics from the Institut Supérieur d'Electronique du Numerique (ISEN, France) in 1992 and a PhD in electronics from the Institut d'Electronique et Micro-électronique du Nord (IEMN, France) in 1997. Then he joined the Optics and Photonics Division of CEA-Leti as a characterization and modeling engineer for quantum IR imagers. Starting from 2004, he managed several R&D projects with the French defense procurement agency (DGA) involving the design of advanced IR imagers. From 2008 to 2012, he headed the Leti imaging characterization team involved in the specification and characterization of new imagers designed at Leti. In 2012, he became coordinator of the joint laboratory between Lynred (formerly Sofradir) and Leti. From 2015 onwards, he was in charge of Leti's strategic partnerships in infrared imaging with Lynred and coordinated the setup of many R&D projects with DGA, DGE, ESA, CE (H2020). Since 2021, he is partnership manager for Visible Imaging in interaction with STmicrolectronics and international partners.

References

**From Imaging to Optical Sensing, the road to machine dedicated sensors.**

E. Mazaleyrat
Director of Technology Scouting and Innovation
STMicroelectronics, Grenoble, France

**Abstract**
Image sensors started development trying to match the eye's (and brain) performance. Great achievement have been done, as current smartphones are demontrating. In order to facilitate the automatization and bring additional features to the use, new sensors are developed targeting machine/robot applications. During this talk, we shall present the lastest development of STMicroelectronics.

**Biography**
Eric MAZALEYRAT is working in the field of Imaging/Optical Sensing since 2000. He has been involved in the development of several generations of CIS from pixel pitch of 5.6µm to 1.1µm. He was also managing developments of Infrared and Near Infrared sensors.
Passionated by the light engineering, he is also following projects around Metasurfaces, Photonic Integrated Circuits, miniaturized spectrometers and other new technologies, inside the Imaging Strategy Office, as the responsible for Technology Scouting and Innovation.

References

B. Dielacher
Business Development Manager
EV Group, St. Florian am Inn, Austria

**Biography**
Dr. Bernd Dielacher is business development manager at EV Group (EVG) where he evaluates global market trends and develops growth opportunities for EVG's bonding, lithography and nanoimprint businesses with a particular focus on the MEMS, biomedical technology and power device market.
Bernd holds a master’s degree in Microelectronics from Vienna University of Technology and received a PhD in Biomedical Engineering from ETH Zurich.

References

## Topic Coming Soon

P. Ancel
In-Vehicle-Technologies Leader
BMW, Munich, Germany

**Abstract**
The vast majority of innovations in cars relies on software and electronics. Owing to the large number of suppliers and ECUs the software and electronics are distributed over, robust and performant in-vehicle networking (IVN) technologies represent a fundamental part of the infrastructure for modern zonal architectures in vehicle. The requirements on these communication technologies thereby are also continuously increasing while time-to-market & costs are shrinking. What does it change, to the E/E innovation process of IVN technologies? This presentation will show, how BMW's IVN development department manage the innovation, based on examples with Automotive Ethernet (E/E Backbone) & SerDes (cameras and displays).
A brief introduction to innovation and the rational for standardization.
E/E zonal architectures and semiconductor supply chain impact on the in-vehicle networking (IVN) technologies. What has changed?
How BMW's IVN department manage time-to-market, costs competitiveness & the best customer experience.
A look into the future trends & technologies

**Biography**
Patrice Ancel is SW Embedded engineer. For the last 21 years, he worked in the automotive industry; most of which at BMW. After successfully introducing Ethernet as a networking technology in the BMW 7 Serie in 2008 between the Head-Unit and the Rear Seat Entertainment, he worked as manager in the BMW-I power electronic development project for the BMW I3 and I8. Since 2020 is leading the In-Vehicle-Technologies for BMW

References

# New Topology for MEMS Advances Performance and Speeds Manufacturing

E. Aguilar
CEO
Omnitron Sensors, Inc., Los Angeles, United States of America

**Abstract**
For too long, complex, expensive and laborious ways of manufacturing MEMS devices have slowed the growth of a critically important microscale technology.
Omnitron Sensors has introduced a new topology for MEMS — its process IP — which rearranges existing modules to streamline the assembly process and improve capacitance per unit area. This approach increases device performance and accelerates the production of MEMS devices for price-sensitive, high-volume markets.
Omnitron's first product, a 3D MEMS step-scanning mirror for long-range LiDAR, is a proof point of its topology. Omnitron's device is a large 15mm in diameter mirror with tens of degrees of motion and the ability to do step scanning. It's the first MEMS mirror to meet the full requirements of FMCW, addressing the mechanical-articulation needs of modern LiDAR in autonomous navigation and ADAS.
The speaker will provide an overview of Omnitron's topology for MEMS and will explain how it may be applied to precision applications such as LiDAR, augmented reality, and image stabilization.

**Biography**
Eric Aguilar is a visionary leader in advanced sensor systems for complex applications such as robotics and autonomous platforms.
Eric's expertise includes leading teams at Tesla, where he managed a crew of 300 engineers on the firmware for Model 3, and at X, where he spearheaded the development of Google Project Wing, an autonomous drone delivery service.
Eric led sensor integration at Argo AI. He previously steered product development for a sensor company later acquired by Google for $85M.
Eric earned a BS in Electrical Engineering from California State Polytechnic University.

References

## Next generation photoacoustic imaging with xMUT technology: status and challenges

P. Leisching
Chief Technology Officer
iThera Medical GmbH, Munich, Germany

**Abstract**
We introduce photoacoustic imaging as a new modality to enhance ultrasound images by molecular information. The key for imaging simulaneously the two modalities ultrasound and photoacoustic are new xMUT technologies, as piezo based systems are not easily combined with preamplifiers. The use of piezo based technologies in photoacoustic imaging will be reviewed, the way forward to integrate PMUT and CMUT transducers with preamplifiers will be discussed. The key of any further integration is the combination of xMUTs and integrated electronics combining preamplifer, averaging and code gain electronic technology.

**Biography**
In June 2022 Patrick started working as CTO for iThera Medical in Munich and is listening to molecules to open a new era of in-vivo medical imaging. Beforehand he was engaged for 12 years as SVP R&D for TOPTICA Photonics in Munich, scaling the diode-laser based company revenue from 14M€ to 105M€. His industry career started 1998 at Siemens in Munich, where had various functions from research to project management and head of optical systems R&D department. Later at Nokia Siemens Networks he was engaged as head of portfolio management and finally head of product management for the operating systems software of optical and packet transmission systems. He holds academic degrees from Technical University of Munich (Dipl.-Phys., laser physics and semiconductor physics) and RWTH Aachen (Dr. rer. nat., III-V quantum well semiconductors), the post-doc as Feodor Lynen fellow was performed at Ecole Polytechnique in Paris (II-VI magneto-optic semiconductors).

References

## Sensors for monitoring vital signs in wearable devices

M. Arzberger
Senior Director
ams-OSRAM International GmbH, Regensburg, Germany

**Abstract**
It started with step counting. Activity tracker wristbands first brought the concept of daily lifestyle monitoring to public attention: the early adopters rapidly acquired the habit of counting the number of steps they walked each day – and of sharing their count with friends, family and colleagues. The capabilities of the first wearable devices were limited. Thanks to massive improvements in the performance of the components that enable activity measurement, products such as smart watches, smart rings and smart wristbands on the market today can measure far more physical parameters and measure them much more accurately.

The adoption of wearable technology has given rise to the idea of the 'quantified self'. This marks a profound shift in the way people think about personal health. Previously, people could follow a set of guidelines or principles that were associated with good health outcomes. This advice generally revolved around healthy eating, taking regular exercise, sleeping well and so on. People could take occasional health checks at a clinic, but there was no way for a person to measure continuously the effect of their lifestyle on their health.

The introduction of wearable devices offered the promise of more information and created a demand from consumers to know more about their health status in real-time: actual measurements that show whether their lifestyle is making them either more or less healthy. This is part of a trend, supported by the increased use of data analytics, artificial intelligence and other advanced technologies in western healthcare systems, called '4P healthcare': participative, predictive, preventive and personalized.

The key measurements of health are the vital signs that medical practitioners have long relied on: factors such as heart rate, blood oxygen saturation (SpO2), blood pressure, body temperature, and heart activity as measured electrically by an electrocardiogram (ECG). Thanks to sophisticated optical and electrical semiconductor systems and software from ams OSRAM and others, wearable devices can perform these vital sign measurements well – in some cases, almost as accurately as the specialist equipment in hospitals. We will show the recent developments of the sensors and sensor components enabling this progress.

**Biography**
Markus Arzberger is Senior Director and Head of the Automotive and Vital Signs Product Line at ams OSRAM. He has more than 20 years of experience in product and business development in the optoelectronic industry. Markus is passionate about understanding customer needs and solving them by generating new solutions that take advantage of leading-edge optoelectronics technologies. He holds a Ph.D. in Physics from the Technical University of Munich, with research focusing on low-dimensional semiconductor physics including laser devices.

References

# Pioneering Non-invasive Wearable MIR Spectrometry for Key Health Biomarkers Analysis

J. F. Kischkat
CEO
Quantune Technologies GmbH, Berlin, Germany

**Abstract**
Modern medicine has improved dramatically through a better understanding of what causes a condition or what it is correlated to. However, the healthcare system still follows an episodic (reactive) model, where patients only seek medical advice when there are symptoms, which, for certain medical conditions, has proven critically insufficient. Several biomarkers such as uric acid, free fatty acids, or ketone bodies correlate with and thus indicate aspects of chronic conditions such as the metabolic syndrome, prediabetes, or diabetes. The more biomarkers can be measured and quantified with high accuracy, the easier it becomes to make conclusive decisions on the patient's status.
Quantune Technologies provides an alternative approach for the measurement of biomarkers, using Mid-Infrared (MIR) Spectroscopy (or simply Infrared Spectroscopy, not to be confused with Near-Infrared Spectroscopy), the most powerful laboratory analytics tool, used in biological and chemical labs around the world for decades to analyze, among many other things, the molecular composition of body fluids and tissue. Currently, this kind of technology is stuck to laboratory use only due to its desktop size, the need for a vibration-free environment, cryogenic temperatures, and extensive sample preparation and maintenance. Additionally, the devices are expensive, with a cost of around 100k€.
Quantune has developed an MIR spectrometer based on a widely tunable Quantum Cascade Laser and touch-detector based on the photoacoustic effect. It is miniaturized to wearable-level with hyper-scalable production for volume markets. It is also robust and suitable for everyday use. The spectral coverage of the technology of 5–11 µm is ideally suited to detect biomarkers non-invasively and pain-free in the interstitial fluid in the skin.

**Biography**
*Jan studied physics at Humboldt-University Berlin and at the University of Illinois at Urbana-Champaign with a Fulbright scholarship. For his PhD, he worked on novel External-Cavity Quantum Cascade Lasers, before founding Quantune Technologies in 2019. Quantune is transforming infrared spectroscopy by bringing its lab-grade analytical power to new markets and people's lives. He co-authored 6 patent families and has won several scientific awards, most notably the 2023 Bertold Leibinger Innovationspreis.*

References