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5th Annual

FINAL AGENDA

Sensors Summit 2019

Commercializing Next Generation Sensors for Real-World Applications

DECEMBER 10 - 12, 2019 • HILTON SAN DIEGO RESORT & SPA • SAN DIEGO, CA



HEALTHCARE APPLICATIONS STREAM

- Sensors for Medical Device and Implantable Applications
- Sensor R&D for Healthcare Applications



MANUFACTURING STREAM

- Materials, Design and Engineering for Sensor Manufacturing
- MEMS Enabled Smart Sensor Manufacturing



EMERGING APPLICATIONS STREAM

- Sensors for Chemical and Biological Detection
- Connectivity and Data for Sensors: IoT, AI & More

11

Countries Represented

85+

Organizations & Companies

6

Conference Tracks

6

Conference Tutorials



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Comprehensive sponsorship packages allow you to achieve your objectives before, during, and long after the event. Signing on earlier will allow you to maximize exposure to hard-to-reach decision-makers.

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Showcase your solutions to a guaranteed, targeted audience. Package includes a 15- or 30-minute podium presentation on the scientific agenda, exhibit space, branding, full conference registrations, use of the event mailing list and more.

Luncheon Presentations

Opportunity includes a 30-minute podium presentation in the main session room. Lunch will be served to all delegates in attendance. A limited number of presentations are available for sponsorship and they will sell out quickly. Sign on early to secure your talk!

One-on-One Meetings

Select your top prospects from the pre-conference registration list. CII will reach out to your prospects and arrange the meeting for you. A minimum number of meetings will be guaranteed, depending on your marketing objectives and needs. A very limited number of these packages will be sold.

Invitation-Only Dinners/Hospitality Suites

Select specific delegates from the pre-registration list to attend a private function at an upscale restaurant or a reception at the hotel. From extending invitations, to venue, to suggestions, CII will deliver your prospects and help you make the most of this invaluable experience.

Exhibit

Exhibitors will enjoy facilitated networking opportunities with qualified delegates, making it the perfect platform to launch a new product, collect feedback, and generate new leads. Exhibit space sells out quickly, so reserve yours today!

Additional Opportunities Available for Sponsorship Include:

- Poster Awards
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- Program Guide Advertisement
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Looking for additional ways to drive leads to your sales team?

CII's Lead Generation Programs will help you obtain more targeted, quality leads throughout the year. We will mine our database of over 800,000 life science professionals to your specific needs. We guarantee a minimum of 100 leads per program! Opportunities include:

- White Papers
- Custom Market Research Survey
- Webinar
- Podcasts

For additional information regarding sponsorship and exhibit availability, please contact: Jon Stroup
Senior Manager, Business Development
781.972.5483 | jstroup@cambridgeinnovationinstitute.com



TUESDAY, DECEMBER 10 4:00-6:00 PM

Tutorial 1: Battery Power & Safety for Medical Devices & Implantables*Shmuel De-Leon, CEO, Shmuel De-Leon Energy Ltd.*

Batteries have become daily used components for many medical devices. As more and more portable medical devices depend on batteries for their operation, it is vital to understand what the special requirements for medical batteries are, what batteries are available in the market and the process needed to certify them for a medical device. The tutorial will focus on implantable batteries and non-implantable miniature primary and rechargeable batteries for medical devices. Battery electrochemistries like primary Zinc-Air, Silver Oxide, Lithium Iron Disulfide, LiMnO₂, Li-CFx and rechargeable Li-ion will be covered. Some attention will be made for wearable batteries, primary and rechargeable, flexible and non-flexible as well. This tutorial is a must for every medical device designer. In addition, this tutorial will focus on portable and stationary medical battery safety along the battery cycle life (acceptance tests, testing, battery pack assembly, usage, transportation and disposal). The tutorial will provide attendants with the knowledge needed to safely handle medical batteries in their organization and to support safety events reduction.

Tutorial 2: Sensor Commercialization*Roger Grace, President, Roger Grace Associates; Vice President Americas, MANCEF (Micro and Nanotechnology Commercialization Education Foundation)*

The objective of the Micro, Nano and Emerging Technology Commercialization Education Foundation (MANCEF) is to provide product developers with pragmatic, detailed and actionable information needed to be addressed in the design, development, manufacturing and test process to bring a product to the market with the focus on sensors and where possible, on the medical application of these devices/systems. This tutorial will present the latest approaches to overcoming the barriers to commercialization through effective design, engineering and manufacturing scalability.

Tutorial 3: Customer-Affordable Handheld Near-Infrared Spectrometers: On-Site Quality Control and Protection against Product Counterfeiting*Heinz Siesler, PhD, Physical Chemistry, University of Essen*

Miniaturization of near-infrared (NIR) spectrometers has recently undergone a rapid development and marketing companies predict miniature spectrometers a bright future that is mainly based on consumer applications and on-site measurements. However, contrary to the exaggerated claims of many direct-to-consumer companies that advertise their scanners with cloud evaluation of big data the tutorial will outline the realistic application potential of these instruments for consumer-relevant materials.

WEDNESDAY, DECEMBER 11 4:00-6:00 PM

Tutorial 4: Digital Health and Wellness: Lessons Learned and New Frontiers*YuFeng Yvonne Chan, MD, PhD, Associate Professor & Director Digital Health, Genetics & Genomic Sciences & Emergency Medicine, Icahn School of Medicine at Mount Sinai**Maurizio Macagno, CTO & Co-Founder, Sensoria, Inc.*

This tutorial will provide valuable lessons and future outlooks from two experienced speakers in digital health. Yvonne Chan, MD, PhD, will share latest lessons learned from the pioneering Mount Sinai Asthma Mobile Health Study powered by Apple's ResearchKit framework and other ongoing efforts in the space. Maurizio Macagno will discuss how embedded sensors, microelectronics & mobile smart watch applications with real-time alerting capabilities are extending the reach of the clinician beyond the walls of the hospital and providing the aging population the ability to live independently longer and safer.

Tutorial 5: Overcoming the Pitfalls to Commercialization—Achieving Success through Effective Strategic Planning & Implementation*Roger Grace, President, Roger Grace Associates; Vice President Americas, MANCEF (Micro and Nanotechnology Commercialization Education Foundation)*

This session will feature a panel of experts to discuss key case study successes and failures and what innovative startup companies are doing to achieve success in sensors development. Our interactive panel will discuss the latest developments and will provide feedback and advice on viability to the pathway to commercialization. Don't miss this opportunity to address many issues on the topic of commercialization including barriers to the commercialization of sensor technology as well as the strategies to overcome these barriers.

Tutorial 6: Analytics at the Edge*David Goldstein, President & CEO, AssetLink Global LLC*

The global technology landscape is volatile, shifting, and fast-moving. And when it comes to wireless connectivity, it seems like every day new, innovative technologies are being developed to improve the connections between people, systems, and things. The explosion in the number of connected equipment and wearables means more touch-points to monitor, manage, and monetize. With billions of new IoT edge devices projected to come online over the next decade, next-gen multi-band wireless standards are sure to surface that provide the throughput and capacity needed to manage the data needs on a massive and global scale. The ability to bake wireless scalability, future-proofing, and sustainability into the IoT solution will be increasingly difficult. This tutorial will discuss strategies to improve timely access to large volumes of data, to improve actionable intelligence and predictive analytics.

**Included in 3-day and 2-day pricing but separate registration available*





Sensors for Medical Device and Implantable Applications

Enabling Better Patient Outcomes through Proper Design and Integration

TUESDAY, DECEMBER 10

7:30 am Registration and Morning Coffee

Plenary Session

8:20 Chairperson's Remarks

Christopher Hartshorn, PhD, Program Director, Cancer Treatment & Diagnosis, National Institutes of Health; National Cancer Institute

8:30 Predictive Analytics in Digital Diagnostics for Management of Chronic Conditions

Rafael Carburaru, PhD, Vice President R&D, Boston Scientific

9:00 Regulatory Considerations during Mobile Medical App Development for Commercial and Clinical Trial Use

Mike Benecky, Senior Director, Global Regulatory Affairs in Precision and Digital Medicine, GlaxoSmithKline

Mobile medical apps are defined as medical devices from their intended use. Mobile medical app regulation is health risk-based to balance patient safety and barriers to technological innovation. Medical device patient risk analysis is a critical prerequisite prior to sensor/app inclusion within a clinical trial. Key components of quality management systems for mobile medical apps include: software requirements/specifications, user acceptance testing, software postmarket surveillance, software version control, and medical device adverse event reporting.

9:30 Nanotechnology, MEMS, Microfluidics for Health 4.0 Hypermobility

Ali Tinazli, PhD, Senior Director & Head, Healthcare & Life Sciences Strategy, Hewlett-Packard, HP Inc., CTO Office

New imperatives of healthcare are focusing on prevention, personalization of diagnostics and treatment, and democratization, including access to everyone, anywhere, anytime at a low cost. The technology convergence in medicine is enabled by the powerful combination of microelectronics, microfluidics, distributed network, and data analytics.

10:00 Networking Coffee Break

10:30 Roundtable Discussions (See website for more details.)

Next-Generation Wearable and Implantable Sensors

11:25 Chairperson's Remarks

Nick Van Helleputte, PhD, R&D Manager Biomedical Circuits & Systems, imec

11:30 Faults in Continuous Glucose Monitors: Cause, Effect, and Potential Solutions

Disha B. Sheth, PhD, Senior Scientist, DexCom Inc.

Advancements in continuous glucose monitoring (CGM) – non-adjunctive use and zero-calibrations – have been transformative for diabetes patients. Latest sensor technology and algorithms have resulted in sub-ten Mean Average Relative Differences (MARDs). However, there are some remaining difficult physiology related discrepancies. Complexity of immune responses, foreign body responses, patient to patient differences, and patch adhesion are causing inaccuracies. Drug-eluting sensors, multi-sensing elements, and self-learning algorithms are some of the potential solutions to these faults.

12:00 pm The Connected-Self Using Cloth-Based Nanotechnology: From R&D to Clinical Utility to Commercialization

Venk Varadan, Co-Founder and CEO, Nanowear

The early days of Connected-Self R&D could not overcome necessary efficacy and safety requirements in sufficient time to live up to the hype for medical use. After nearly ten years, there are specific technologies, products, and therapeutic areas that have emerged from this challenging phase of R&D, proving their value clinically and improving patient lives from the comfort of their own home

12:30 Sponsored Presentation (Opportunity Available)

1:00 Enjoy Lunch on Your Own

Next-Generation Wearable and Implantable Sensors (Cont.)

1:55 Chairperson's Remarks

Nick Van Helleputte, PhD, R&D Manager, Biomedical Circuits & Systems, imec

2:00 Non-Invasive Biochemical Sensing: Breakthrough for Precision Medicine

Gavi Begtrup, PhD, CEO, Eccrine Systems, Inc.

Today's non-invasive electronic health patches perform conventional measures like heart activity and body motion, while the medical field awaits continuous wearable sensing of chemical information like that found in blood draws. All this is now rapidly changing as sweat biosensing is targeting a first killer application in medication monitoring, enabling precision dosing through non-invasive, direct measurement of individual drug response.

2:30 The Customer behind the Customer/Sensor Design for Patient Usability

Grant Hughes, Co-Founder & Chief Strategy Officer, FocusMotion Health

In designing and implementing solutions, tech companies want to show off their bright shiny data, yet often forget the technology sophistication of the end user: the patient. Machine learning and millions of data points don't matter if we can't engage the patient or if we can't provide usable, actionable data for the surgeon or the hospital. How do we design to serve both customers?

3:00 FEATURED PRESENTATION: Leveraging AI to Improve Performance of Medical Sensors

Andrea Varsavsky, PhD, Senior Engineering R&D Manager, Medtronic Diabetes

With increased volumes of sensor data from medical sensors now available through their widespread use, more advanced analytics including machine learning can be utilized to derive algorithms that calculate the sensor outputs. In this presentation, we will describe how AI, large sensor databases and in-built diagnostics signals were leveraged to improve the accuracy of glucose sensors and greatly reduce user burden, without any changes in sensing technology.

3:30 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Tutorials (See page 3 for details.)

6:00 Welcome Reception in the Exhibit Hall with Poster Viewing

7:00 End of Day

WEDNESDAY, DECEMBER 11

8:00 am Registration and Morning Coffee

Plenary Session

8:20 Chairperson's Remarks

Robert Rubino, Senior Director, Research and Development, Integer

8:30 Dexcom's Continuous Glucose Monitoring (CGM) Technology and Its Impact on Diabetes Management, Artificial Pancreas, & Digital Health Systems

Peter Simpson, Vice President of Sensor R&D and Advanced Technology, Dexcom

Recent advances in continuous glucose monitoring (CGM) technology have significantly increased its usability and impact on diabetes management. CGM's are now widely reimbursed and are rapidly becoming the standard of care for people on intensive insulin therapy. This presentation will provide an overview of Dexcom's CGM sensor technology, its use in digital health and artificial pancreas systems and a preview of our future products.

9:00 Objective Measures for Clinical Assessment and Precise Understanding of Disease Progression

Christopher Hartshorn, PhD, Program Director, Cancer Treatment & Diagnosis, National Institutes of Health; National Cancer Institute

This talk will look at various efforts across the National Institutes of Health attempting to enable more objective measures for out-of-clinic, patient-specific assessment and longitudinal understanding of disease progression in large cohorts.

9:30 Wearable Electrochemical Sensors – Recent Advances

Joseph Wang, Distinguished Professor & Chair, Nanoengineering, University of California, San Diego

This presentation will discuss recent developments in the field of wearable electrochemical sensors integrated directly on the epidermis or within the mouth for various non-invasive biomedical monitoring applications. Particular attention will be given to non-invasive monitoring of metabolites and electrolytes using flexible amperometric and potentiometric sensors, respectively, along with related materials, energy and integration considerations. The preparation and characterization of such wearable electrochemical sensors will be described, along with their current status, future prospects, and challenges.

10:00 Coffee Break in the Exhibit Hall with Poster Viewing

10:30 Roundtable Discussions (See website for more details.)

Clinical vs. Consumer Sensors

11:25 Chairperson's Remarks

Joshua Windmiller, PhD, MSc, Co-Founder & CTO, Biolinq, Inc.

11:30 PANEL DISCUSSION: The Medical Sensor Technologist's Dilemma - Clinical or Consumer Sensor

Moderator: Joshua Windmiller, PhD, MSc, Co-Founder & CTO, Biolinq, Inc.

Panelists: Tom Calef, CTO, Activ Surgical

YuFeng Yvonne Chan, MD, PhD, Associate Professor & Director Digital Health, Genetics & Genomic Sciences & Emergency Medicine, Icahn School of Medicine at Mount Sinai

Patient outcomes and standardization of care continue to benefit from smarter and sensor-enabled medical devices that provide real-time patient monitoring and device performance data. The challenge is selecting the right sensor, including deciding between consumer or clinical-grade sensors. This panel will evaluate the tradeoffs between these two sensor classes as the panelists tackle this dilemma.

12:30 pm Sponsored Presentation (Opportunity Available)

1:00 Enjoy Lunch on Your Own

Ingestible and Insertable Sensors

1:55 Chairperson's Remarks

Joshua Windmiller, PhD, MSc, Co-Founder & CTO, Biolinq, Inc.

2:00 Turning on the Lights - Improving Outcomes and Increasing Access with Digital Medicines

Jeremy Frank, PhD, Senior Vice President Digital Medicine, Digital Medicine, Proteus Digital Health

The cost of sub-optimal pharmacotherapy is immense - 125,000 lives and over \$500 billion annually in the US alone. Poor patient adherence to prescriptions dominate that expense. Current ineffective cost-control approaches do not address the information gap between physicians and their patients that is the fundamental root-cause. The Proteus digital-medicine platform integrates medication with hardware, software, analytics and services to deliver that exact information.

2:30 Advancing Diagnostics in Endoscopy: Quantifying Inflammation through Perfusion Sensing

George Duval, Principal Engineer, Endoscopy R&D, Boston Scientific Corp.

Inflammation is the root of a lot of digestive diseases like Ulcerative Colitis, Barrett's Esophagus, and more. With today's tools, gastroenterologists using direct visual observations are very subjective to interpretation. The desire to quantify inflammation objectively during an examination could mean improved patient outcomes and procedures. We have been researching a variety of sensing technologies that show promise in quantifying inflammation.

3:00 Ingestible and Insertable Technology for Advanced Monitoring of the GI System

Nick Van Helleputte, PhD, R&D Manager, Biomedical Circuits & Systems, imec

Globally metabolic health is dropping at an alarming rate. The human gastro-intestinal system is a very complex system and actually rather accessible, certainly considering recent technological advances in sensing and miniaturization. This talk will focus on technological innovations needed to provide a holistic view of the human GI system in the form of ingestibles or minimally invasive insertables.

3:30 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Tutorials (See page 3 for details.)

6:00 End of Day



Sensors R&D for Healthcare Applications

Commercializing the Latest Advances in Next-Generation Biosensors

THURSDAY, DECEMBER 12

7:30 am Registration and Morning Coffee

Plenary Session

8:00 Chairperson's Remarks

Craig Wohlers, Executive Director, Conferences, Cambridge Innovation Institute

8:10 AI to the Rescue: Curing and Augmenting Brain Capabilities with the Smart Kiwi Nano-Implant

Newton Howard, PhD, Professor Neurocomputation and Neurosurgery, Brain Sciences Foundation, Oxford University; Chairman, Board of Directors, ni2o

Brain Computer Interface technologies are in constant improvement with interaction modalities ranging from non-invasive (EEG, TMS, etc.) to chronically implanted devices. We are presenting here Kiwi, a novel, minimally invasive micro-implant using nanotechnologies to record the electrical activity of neural tissue and stimulate using electrical and optical stimulation modalities. Kiwi micro-implant is operating wirelessly and is coupled to a cutting-edge AI module providing the possibility to detect in real-time neural activity patterns and adjust the stimulation parameters accordingly. This adaptative, minimally invasive and smart BCI opens a new way for personalized therapeutic applications in numerous diseases such as neurodegenerative diseases (Parkinsons, Alzheimers, etc.), mental illnesses (depression, anxiety, etc.) or chronic pain, brain augmentation, and research device.

8:35 PANEL DISCUSSION: Sensor Mergers & Acquisitions: Models for Success and Lessons from Failures

Moderator: Andy Gilicinski, Global Vice President, Research Development & Engineering, Mergers and Acquisitions, Johnson & Johnson

This panel discussion will examine the current landscape of mergers and acquisitions with the sensors and device space. Our panel of experts will discuss the current outlook within the marketplace and will examine past success and failures and how the pitfalls of failure can be avoided.

9:25 Coffee Break in the Exhibit Hall with Poster Viewing

Advanced Biosensor Design, Materials & Engineering

9:55 Chairperson's Remarks

Marcie Black, PhD, CEO, Advanced Silicon Group

10:00 Micro Raman Sensing for Cancer Applications

Gregory Auner, PhD, Paul Strauss Endowed Chair; Professor, Department of Surgery and Biomedical Engineering; Director, Smart Sensors and Integrated Microsystems Program, Wayne State University

Novel approaches toward understanding the evolution of disease can lead to the discovery of biomarkers that will enable better management of disease progression and improve prognostic evaluation. Raman spectroscopy is a promising investigative and diagnostic tool that can assist in uncovering the molecular basis of disease and provide objective, quantifiable molecular information for diagnosis and treatment evaluation. This presentation will review the use of state-of-the-art micro Raman spectroscopy sensing of cancer, utilizing the power of trained Deep Learning algorithms for near instantaneous diagnosis in the OR and clinical setting.

10:30 Engineering in Medical Diagnostics and Therapeutics: New Treatment Options for Gastric Cancer

Anna Radovic, PhD, Associate Professor, Northeastern University

Modern medicine depends on combined efforts of engineers and biologists. We tested a plant metabolite Gallic Acid (GA) as an alternative treatment for gastric cancer, one of the deadliest worldwide. Using MEMS sensors, DNA microchip arrays, and molecular biology techniques we identified the likely target for the treatment and evaluated its efficiency. We demonstrated the GA ability to reverse malignant transformation in cell culture.

11:00 Nanosensors for 30-Second Handheld Pathogen Detection

Lisa Diamond, CEO, Pinpoint Science LLC

Pinpoint Science offers unique nanosensor technology for low-cost detection of viral, bacterial and fungal pathogens in seconds, with detection levels below 500 femtograms/ml. This unique diagnostic platform can use antibodies, oligos, aptamers and nanobodies for rapid, label-free bioelectronic detection and quantification of pathogens in point-of-care settings.

11:30 Electrochemical Sensors and Systems for Wearable and Minimally Invasive Healthcare Applications

Paul Galvin, PhD, Head, ICT for Health Strategic Programs, Tyndall National Institute

This presentation will describe some emerging electrochemical sensors and systems to address the challenges of continuous real-time monitoring of selected biomarkers for wearable and minimally invasive medical devices. Challenges which will be discussed will include sensor and instrumentation design, sensor biocompatibility, how to prevent biofouling impacting on performance, form factor of the system, etc. Some exemplars of the emerging systems will be showcased.

12:00 pm Sponsored Presentation (*Opportunity Available*)

12:30 Enjoy Lunch on Your Own

Market and the Path to Commercialization

1:25 Chairperson's Remarks

Paul Galvin, PhD, Head, ICT for Health Strategic Programs, Tyndall National Institute

1:30 How the Future of Sensing in Health Will Be Transformed with AI and 5G

John Mattison, MD, Assistant Medical Director, Chief Health Information Officer, Kaiser Permanente; Faculty, Singularity University

Advanced Biosensor Design, Materials & Engineering

2:00 Sensors for Health Analysis from Exhaled Breath

Sterghios A. Moschos, PhD, Associate Professor in Cellular and Molecular Sciences; Director of Research and Innovation; Director of Postgraduate Research, Department of Applied Sciences, Northumbria University

Since breath alcohol measuring devices became handheld, many companies have tried to replicate this success for other conditions and disease- with no success. The problem has proven to be high variability, sample contamination risks, and even sample loss- all contributing to unreliable data, even with 35-pound desktop instruments. We have addressed these three problems specifically by developing a new, handheld breath capture device. Our preliminary data further show that our solution is capable of detecting and analysing microorganisms living deep in the lung, in a fully non-invasive manner. The patent-protected technology has utility beyond human/veterinary healthcare and well-being in the biodefence, environmental monitoring, agritech and food sectors.

2:30 Silicon Nanowire Biosensors

Marcie Black, PhD, CEO, Advanced Silicon Group

We present Advanced Silicon Group's nanowire biosensor which enables low cost, multiplexed, and rapid detection of proteins and DNA using one test. The nanowires make the sensor more sensitive to its environment allowing detection of dilute solutions. Our vision is to make diagnostics rapid, easy to use, and low cost so that everyone has access to good healthcare.

3:00 Refreshment Break in the Exhibit Hall with Poster Viewing

3:30 Wearable, Novel, Optical Sensor for Continuous Noninvasive Blood Pressure (cNIBP) Monitoring

Mohan Thanikachalam, Research Assistant Professor, Public Health & Community Medicine, Tufts University

ViTrack is a first-of-its-kind, cuff-less, wearable, standalone technology for cNIBP monitoring, which includes a novel optical sensor capable of 3D contact sensing at microscale. The wrist wearable ViTrack device captures the spatiotemporal force distribution within the contact region of the skin and utilizes a proprietary new methodology to directly measure (self-calibrate) and continuously track systolic and diastolic BP.

4:00 Health and Wellness through Salivary Diagnostics

Manesh Kalayil Manian, PhD, Research & Development Lead, Traq

Noninvasive approach to monitor individual's physiological and pathological state is one of the most desirable goals in healthcare research. The presence of various disease-signaling biomarkers and ease of sampling and storage makes saliva a useful medium of detection. Traq makes cost efficient, accurate and portable biosensors that can track activity and health data using saliva as a medium in real time. Traq products are designed to go anywhere, giving flexibility of where and when you track personal health and wellness data, decreasing the need for hospital and physician office visits. This powerful solution creates a synergy that can change the way we all approach health. Own Your Health™. This presentation overviews the clinical importance of saliva as a diagnostic medium and portrays the current research and technology development in Traq.

4:30 AI Powered Sensing for Next-Generation Health-Tracking

Karim Arabi, PhD, CEO, Atlazo

Sensing and computing have traditionally been separate functions. Recently, we have seen a trend towards integration of sensing and computing, and with the advent of AI, this trend is accelerating. This talk highlights the benefits of sensing and AI integration for voice activation, context awareness and health-tracking applications.

5:00 Close of Summit

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Materials, Design & Engineering for Sensor Manufacturing

Optimizing Sensor Design & Integration

TUESDAY, DECEMBER 10

7:30 am Registration and Morning Coffee

Plenary Session

8:20 Chairperson's Remarks

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Mike Benecky, Senior Director, Global Regulatory Affairs in Precision and Digital Medicine, GlaxoSmithKline

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10:30 Roundtable Discussions (See website for more details.)

Market and the Path to Commercialization

11:25 Chairperson's Remarks

Steve Lerner, CEO, Alpha Szensor

11:30 BARDA's New Division of Research Innovation for the Development of Next-Generation Wearables

Justin Yang, Program Officer, Acting Program Manager, Early Notification to Act, Control and Treat (ENACT) Program, DRIVe Division, Biomedical Advanced Research and Development Authority in the Office of the Assistant Secretary for Preparedness and Response, U.S. Department of Health & Human Services

This presentation will provide an overview of the vision of the Biomedical Advanced Research & Development Authority's new Division of Research, Innovation, and Ventures in the Department of Health and Human Services and their new focus on wearable technologies. We are funding multiple projects seeking to improve healthcare and health outcomes by enabling Americans to monitor their own health. We seek wearable technologies to enable a notification of impending disease before symptoms arise.

Advanced Sensor Materials & Engineering

12:00 pm Miniaturization Technologies for Implantable Devices

Robert Rubino, Senior Director, Research and Development, Integer

In order to make future implantable medical devices as minimally invasive and cost-effective as possible, devices will need to become smaller and easier to

implant. This will require the development of alternative assembly technologies and materials. Reduction in the size of the power source, while still retaining the high level of reliability required, will be one critical element to reduce device size. New concepts to allow for miniature scale assembly of hermetic, biocompatible coin cells and thin film cells have been developed by leveraging traditional glass-to-metal and ceramic-to-metal seal technologies. Ceramic device enclosures, which allow for more efficient energy transfer to the device from external power sources due to reduced eddy currents, have been developed to minimize recharge time or eliminate the need for a power source completely. In addition, biocompatible, hermetic conductive vias through ceramic substrates enable further size reduction of device feedthroughs and can act as active electrodes for sensing or therapy. Combined, these technologies can be used to produce sensing and stimulating implants that provide enhanced convenience for patients and physicians.

12:30 Sponsored Presentation (Opportunity Available)

1:00 Enjoy Lunch on Your Own

Advanced Sensor Materials and Engineering

1:55 Chairperson's Remarks

Roger Grace, President, Roger Grace Associates

2:00 Radio Ranging with Ultra-High Resolution with Passive Markers

Edwin Kahn, PhD, Principal Investigator & Professor, School of Electrical and Computer Engineering, College of Engineering, Cornell University

Accurate locating of specific points in an indoor setting is critical for applications, including robotic feedback control and non-intrusive structural integrity monitoring. Current optical and ultrasound approaches often suffer from insufficient accuracy, obstruction by other objects, and ambiguous identification. Alternatively, conventional radar-like radio frequency (RF) methods can suffer from problems such as multipath ambiguity, small time of flight, and limited item recognition. Attachment of a passive RF identification (RFID) tag can provide a unique marker by modulating the backscattering signal, but current systems struggle with large interference and noise, and thus have poor ranging accuracy. Here we show that a 1 GHz harmonic RFID system can provide a ranging resolution of less than 50 microns in air and less than 5 microns in water with a sampling rate of greater than 1 kHz. The fundamental limits on ranging precision in our system are traced to the phase noise of the RF source and the aperture jitter of the data converter. Due to the low signal loss of the RF band we choose, the small passive tag to be precisely tracked can be embedded in underwater objects as well as within building structures.

2:30 Low Power, Highly Scaled IoT Gas Sensors Using Carbon Nanotubes

Steve Lerner, CEO, Alpha Szensor

In the world of gas sensors that currently contend for Edge-based detection, incumbent technologies carry significant limitations with respect to integration, cost and power consumption. Sensor power consumption is a fundamental constraint for all portable sensing devices, particularly as the vision of energy harvesting and ubiquitous sensing at the Edge materialize. More recently, Carbon Nanotube sensors have evolved to being one of the most cost-effective options with greater packing density, higher sensitivity and selectivity, than most gas sensors, while consuming up to 3 orders of magnitude less power. This talk will discuss the inherent advantages of ultra-low power gas sensors and some of the applications that are being enabled as a result. From medical diagnostics to fitness monitors to environmental applications analyzing the quality of air, soil, water and food. CNT sensors are positioned to revolutionize our automated sense of smell and taste.

3:00 The Integration of Flexible Tactile Sensors into Biomedical and Consumer Products

Robert Podoloff, CTO, Tekscan; Lecturer, Massachusetts Institute of Technology

This talk will focus on the information that flexible tactile sensors can provide and the process for integrating them into consumer products. Several applications examples ranging from prevention of occlusion in insulin delivery lines to the measurement of dynamic automobile tire footprints will be presented along with a live demonstration of the technology.

3:30 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Tutorials (See page 3 for details.)

6:00 Welcome Reception in the Exhibit Hall with Poster Viewing

7:00 End of Day

WEDNESDAY, DECEMBER 11

8:00 am Registration and Morning Coffee

Plenary Session

8:20 Chairperson's Remarks

Robert Rubino, Senior Director, Research and Development, Integer

8:30 Dexcom's Continuous Glucose Monitoring (CGM) Technology and Its Impact on Diabetes Management, Artificial Pancreas, & Digital Health Systems

Peter Simpson, Vice President of Sensor R&D and Advanced Technology, Dexcom

Recent advances in continuous glucose monitoring (CGM) technology have significantly increased its usability and impact on diabetes management. CGM's are now widely reimbursed and are rapidly becoming the standard of care for people on intensive insulin therapy. This presentation will provide an overview of Dexcom's CGM sensor technology, its use in digital health and artificial pancreas systems and a preview of our future products.

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Christopher Hartshorn, PhD, Program Director, Cancer Treatment & Diagnosis, National Institutes of Health; National Cancer Institute

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Joseph Wang, Distinguished Professor & Chair, Nanoengineering, University of California, San Diego

This presentation will discuss recent developments in the field of wearable electrochemical sensors integrated directly on the epidermis or within the mouth for various non-invasive biomedical monitoring applications. Particular attention will be given to non-invasive monitoring of metabolites and electrolytes using flexible amperometric and potentiometric sensors, respectively, along with related materials, energy and integration considerations. The preparation and characterization of such wearable electrochemical sensors will be described, along with their current status, future prospects, and challenges.

10:00 Coffee Break in the Exhibit Hall with Poster Viewing

10:30 Roundtable Discussions (See website for more details.)

Enabling Sensor Commercialization through Collaborative Initiatives

11:25 Chairperson's Remarks

Robert Rubino, Senior Director, Research and Development, Integer

11:30 The NNI Sensors Signature Initiative: Facilitating Collaboration to Advance Nanosensor Development and Commercialization

Stacey Standridge, PhD, Deputy Director, National Nanotechnology Coordination Office

The NNI's Nanotechnology for Sensors and Sensors for Nanotechnology Signature Initiative (Sensors NSI) coordinates efforts and stimulates existing and emerging projects across federal agencies to explore the use of nanotechnology for the development and commercialization of sensors. This presentation will provide an update regarding current and planned activities of the Sensors NSI, with specific focus on needs, funding opportunities, and recent activities related to wearable and implantable sensors. The NNI is a U.S. Government research and development initiative involving 20 departments and independent agencies working together toward the shared vision of a future in which the ability to understand and control matter at the nanoscale leads to a revolution in technology and industry that benefits society.

12:00 pm ANSI, the Value of Its Public-Private Partnership

Michelle Dean, Director of Standards Facilitation, American National Standards Institute

ANSI enhances both the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity. One of the great strengths of the U.S. approach to standards and conformance is its public-private partnership. This presentation will provide an overview of this partnership, the U.S. standards process and how the Institute bridges the gap between industry and government and enables information exchange and access among standards developing organizations and public-sector leaders, agencies, and legislators.

12:30 Sponsored Presentation (Opportunity Available)

1:00 Enjoy Lunch on Your Own

Sensor Design and Engineering for Manufacturing

1:55 Chairperson's Remarks

Stacey Standridge, PhD, Deputy Director, National Nanotechnology Coordination Office

2:00 Sputtered Metal Oxide N-P Heterojunctions for Sub-PPM Volatile Organic Compound Sensing

Luisa Bozano, PhD, Manager, Nanoscale Fabrication Group, IBM Almaden Research Center

We present the fabrication and characterization of sputtered SnO₂/NiO n-p heterojunctions thin films and their response to Volatile Organic Compounds (VOCs) at sub-ppm concentrations. In optimal processing conditions, the response of the films to VOCs can be greatly increased and its dependence on temperature, typically described in the context of a Diffusion-Reaction model, altered. In addition, we show that p-type NiO layers of given thickness can trigger a reversal in the response pattern of ultra-thin n-type SnO₂ underlayers.

2:30 Embedded System Ingration

Francois Beauchaud, Principal Engineer, Bus Dev, Bosch RTC

3:00 Cost Versus Power in Embedded Sensor System Design

Mark Buccini, Director Advanced Product Platforms, Advanced Product Platforms, Texas Instruments

This session documents proven embedded sensor system design techniques that both reduce cost and reduce power system consumption, in many cases by an order of magnitude. A clear case study of a battery-powered sensor system is presented with optimization alternatives. Benefits are quantified. A functional example including temperature, light, proximity and motion sensing will be discussed and demonstrated live during this session.

3:30 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Tutorials (See page 3 for details.)

6:00 End of Day



MEMS Enabled Smart Sensor Manufacturing

MEMS R&D for the Manufacturing of Next-Generation Sensors

THURSDAY, DECEMBER 12

7:30 Registration and Morning Coffee

Plenary Session

8:00 Chairperson's Remarks

Craig Wohlers, Executive Director, Conferences, Cambridge Innovation Institute

8:10 AI to the Rescue: Curing and Augmenting Brain Capabilities with the Smart Kiwi Nano-Implant

Newton Howard, PhD, Professor Neurocomputation and Neurosurgery, Brain Sciences Foundation, Oxford University; Chairman, Board of Directors, ni2o

Brain Computer Interface technologies are in constant improvement with interaction modalities ranging from non-invasive (EEG, TMS, etc.) to chronically implanted devices. We are presenting here Kiwi, a novel, minimally invasive micro-implant using nanotechnologies to record the electrical activity of neural tissue and stimulate using electrical and optical stimulation modalities. Kiwi micro-implant is operating wirelessly and is coupled to a cutting-edge AI module providing the possibility to detect in real-time neural activity patterns and adjust the stimulation parameters accordingly. This adaptive, minimally invasive and smart BCI opens a new way for personalized therapeutic applications in numerous diseases such as neurodegenerative diseases (Parkinsons, Alzheimers, etc.), mental illnesses (depression, anxiety, etc.) or chronic pain, brain augmentation, and research device.

8:35 PANEL DISCUSSION: Sensor Mergers & Acquisitions: Models for Success and Lessons from Failures

Moderator: Andy Gilicinski, Global Vice President, Research Development & Engineering, Mergers and Acquisitions, Johnson & Johnson

This panel discussion will examine the current landscape of mergers and acquisitions with the sensors and device space. Our panel of experts will discuss the current outlook within the marketplace and will examine past success and failures and how the pitfalls of failure can be avoided.

9:25 Coffee Break in the Exhibit Hall with Poster Viewing

MEMS Manufacturing Scalability

9:55 Chairperson's Remarks

Roger Grace, President, Roger Grace Associates

10:00 Bulk Acoustic Wave Resonators for Size Reduction in Wireless Microcontroller Units

Jeronimo Segovia-Fernandez, R&D Systems Engineer, Texas Instruments
Bulk Acoustic Wave (BAW) resonators enable high performance, timing-accurate oscillators, which when integrated into the MCU package eliminate the need for bulky external crystals without compromising power, latency or frequency stability. In this talk, I will describe how BAW works, the advantages of adopting this technology in wireless MCUs providing smaller footprints, better cost optimization and more robust designs, and give some guidelines on what aspects of BAW are currently investigated to further enhance resonator performance.

10:30 Scalable Manufacture of CNT-Based Microsensor for Lactate Detection in Sweat

Ahmed Busnaina, PhD, William Lincoln Smith Professor, Distinguished University Professor and Director, NSF Nanoscale Science and Engineering Center for High-Rate Nanomanufacturing, Northeastern University

Non-invasive detection of lactate can help identify hypoxia and exercise-induced muscle fatigue in addition to several other morbidities. To address this gap, we present a novel chemiresistor-like amperometric carbon nanotube (CNT) enabled flexible lactate sensor with a focus on manufacturability and scalability. Sensors are printed using directed assembly of CNTs that are enzymatically functionalized for lactate detection. The sensors are capable of detecting L-lactate with excellent sensitivity (300 A mM⁻¹ cm⁻²) and short response time (<30 s). The results show that one sensor could be continuously used to detect lactate level in sweat for up to ten days.

11:00 Building Next-Generation Neural Interfaces Using Nanoscale Manufacturing

Ingrid van Welie, Founder and CEO, Neural Dynamics Technologies LLC

Neurological disease is projected to be the second largest cause of chronic disease in coming decades, but to confront this development, we need a better understanding of the neural circuit activity that underlies both healthy as well as diseased brain function. To understand the function of dynamical neural circuits we need technologies with the capability to measure the activity of many individual neurons *in vivo*, in intact brains. Neural Dynamics Technologies focuses on the development of new neural interfaces that can record the activity of hundreds to thousands of neurons simultaneously within and across brain regions that will be available at low cost and that offer customizability and compatibility with existing hardware and analysis methods. We use a combination of CMOS and Ebeam lithography to develop devices that have hundreds to thousands of individual recording sites and we are working on integrating stimulation, optical and fluidic capabilities onto our devices.

11:30 MEMS Sensors: The Path to Mass Production

Paul Pickering, CRO, Micralyne; President and Principle Consultant, Alpine Teschle

The adoption of sensors over the last 20 years into numerous, high value markets like automotive, healthcare and mobile handsets has stimulated an unprecedented R&D investment in new devices to address the varied needs in the market. The future looks very bright for the continued growth in the market and the opportunity to design sensors into new applications is very broad. Traditionally, the development process from concept to mass production has been a long and winding road with significant production uncertainties about the critical performance aspects of the device, test methods and reliability. This presentation will provide a successful framework for the productization of sensors in various market segments. This approach to productization is the result of more than 20 years of manufacturing experience in various MEMS fabs. The objective of this presentation is to provide a proven set of best practices and recommended approaches for sensor development, characterization, productization and release to production for MEMS based sensors. Using these practices can accelerate the development, improve production yields and smooth the path to mass production.

12:00 pm Sponsored Presentation (Opportunity Available)

12:30 Enjoy Lunch on Your Own

Flexible Substrate Sensor Integration

1:25 Chairperson's Remarks

Ahmed Busnaina, PhD, William Lincoln Smith Professor, Distinguished University Professor and Director, NSF Nanoscale Science and Engineering Center for High-Rate Nanomanufacturing, Northeastern University

1:30 Paper, Plastic and Fabric: Emerging Platforms for Sensors and Sensor-Based Systems for Emerging Applications

Roger Grace, President, Roger Grace Associates; Vice President Americas, MANCEF (Micro and Nanotechnology Commercialization Education Foundation)

The presentation will provide an overview of printed, flexible, stretchable, functional fabric sensors and accompanying electronics and the applications in the biomed sector that they are currently enabling as well as their future application opportunities. Examples from current suppliers as well as highlights from leading international research organizations will be addressed. In addition to these sensors, we will also address the challenges of their integration with other functional element of basic Internet of Things (IoT) and wearable applications. We will also address the manufacturing issues to create these heterogeneous and hybrid solutions from both a batch mode and continuous process. Concluding presentation topics include barriers to the successful commercialization and recommended strategies for monetization opportunities of these technologies.

Next-Generation Design and Engineering for MEMS Applications

2:00 Sensor Fusion for Self-Navigating Cars Using Inertial MEMS and Odometry

Igor Prikhodko, PhD, MEMS Design Engineer, Analog Devices

We demonstrate inertial navigation for automobiles with position accuracy reaching GPS-like accuracies using a tactical-grade Inertial Measurement Unit (IMU) for direction estimation and a speedometer for velocity estimation. The navigation module fuses inputs from the IMU, On-Board Diagnostics, and GPS to provide a vehicle trajectory estimate in real-time. Based on field tests the position error was 30 centimeters after 5 minutes of drive without GPS.

2:30 Recent Developments in Patient Monitoring, MEMS-Based Drug Screening, and Transdermal Drug Delivery

Ashish V. Pattekar, Principal Scientist, PARC, a Xerox Company

This talk will provide an introduction into our work on patient monitoring at hospitals for improved healthcare delivery and reducing post-discharge hospital admissions and share recent results from ongoing efforts developing MEMS / microfluidics based technologies for High-throughput drug screening (HTS) and Transdermal drug delivery.

3:00 Refreshment Break in the Exhibit Hall with Poster Viewing

3:30 Time-Domain Sensor and System Simulations: Enabling Digital Twin and IoT Development

Mihir S. Patel, PhD, Director of Engineering, OnScale

4:00 Design Challenges and Modeling of MEMS Based Sensor Products

Mary Ann Maher, PhD, Founder & CEO, SoftMEMS

Many of the challenges now seen in bringing MEMS based products to market are occurring as MEMS and companion integrated circuits are combined into systems often on flexible substrates. Current products are increasing in system complexity and often include multiple sensors with special purpose hardware for running sensor fusion and AI algorithms such as neural networks. This talk will cover the challenges and opportunities for designing innovative MEMS systems particularly focusing on the Integrated circuit/ MEMS/Package/Substrate co-design and optimization issues. It will further discuss modeling and simulation of MEMS beginning with detailed sensor design and ending with using the sensor data to drive AI algorithms for IoT based applications. Examples of design issues and their solutions utilizing computer-aided design tools (CAD) are given. Finally, a perspective on the future design, standards, and ecosystem needs in the MEMS industry as new types of sensors and actuators in the bio/chemical and flexible/stretchable/ printed technologies are rolled out is also presented.

4:30 Stretchable Hybrid Sensor System Constructions Based on a Novel Thermosetting Polymer System

Takatoshi Abe, Engineer, Electronics Materials, Panasonic Industrial Devices

Sensor systems for printed and wearable electronics are an area of active research. Current technology based on polymer materials like polyester or thermoplastic polyurethane technology face severe assembly and end-use challenges because of their low temperature tolerances and permanent plastic deformation tendency. Researchers with Panasonic Electronic Materials Division are been developing new materials based on a unique stretchable thermosetting polymer. This presentation will introduce these materials and examples of sensor system constructions based on this technology.

5:00 Close of Summit

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Inquiries: jrning@cambridgeinnovationinstitute.com



Sensors for Chemical and Biological Detection

Delivering High Quality, Complex Information from Any Environment

TUESDAY, DECEMBER 10

7:30 am Registration and Morning Coffee

Plenary Session

8:20 Chairperson's Remarks

Christopher Hartshorn, PhD, Program Director, Cancer Treatment & Diagnosis, National Institutes of Health; National Cancer Institute

8:30 Predictive Analytics in Digital Diagnostics for Management of Chronic Conditions

Rafael Carbunaru, PhD, Vice President R&D, Boston Scientific

9:00 Regulatory Considerations during Mobile Medical App Development for Commercial and Clinical Trial Use

Mike Benecky, Senior Director, Global Regulatory Affairs in Precision and Digital Medicine, GlaxoSmithKline

Mobile medical apps are defined as medical devices from their intended use. Mobile medical app regulation is health risk-based to balance patient safety and barriers to technological innovation. Medical device patient risk analysis is a critical prerequisite prior to sensor/app inclusion within a clinical trial. Key components of quality management systems for mobile medical apps include: software requirements/specifications, user acceptance testing, software postmarket surveillance, software version control, and medical device adverse event reporting.

9:30 Nanotechnology, MEMS, Microfluidics for Health 4.0 Hypermobility

Ali Tinazli, PhD, Senior Director & Head, Healthcare & Life Sciences Strategy, Hewlett-Packard, HP Inc., CTO Office

New imperatives of healthcare are focusing on prevention, personalization of diagnostics and treatment, and democratization, including access to everyone, anywhere, anytime at a low cost. The technology convergence in medicine is enabled by the powerful combination of microelectronics, microfluidics, distributed network, and data analytics.

10:00 Networking Coffee Break

10:30 Roundtable Discussions (See website for more details.)

Innovative Biological Detection and Challenges

11:25 Chairperson's Remarks

Phillip M. Mach, Analytical Chemist, US Army

11:30 Selective and Reversible Biodetection in Complex Matrices Synergistic Roles of Biology and Electronics

Radislav Potyrailo, PhD, Principal Scientist, Chemical & Biological Sensing Lab, GE Global Research Center

We are developing aptamer-based biosensors to achieve new performance capabilities. Aptamers are single-stranded nucleic acids folded into their 3D conformations governed by their sequence and environmental conditions. Here, we will discuss our progress in three directions. First, we enhance biodetection selectivity in complex environments. Second, we introduce our innovative methodology for selection of aptamers. Third, we introduce the highly desired reversibility of biosensors.

12:00 pm eCoating for Electrochemical Sensors – Addressing a Bottleneck to Commercialisation

Pawan Jolly, PhD, Senior Scientist, Wyss Institute, Harvard University

Affinity-based electrochemical sensors offer great potential for the development of multiplexed point-of-care (POC) diagnostics; however, their commercialization has been limited because these devices rapidly lose sensitivity due to biofouling in complex biological fluids. Here we describe a simple drop-casting method that may be used to create sensor coatings that provide potent antifouling properties while retaining electrode conductivity in human blood and plasma.

12:30 Sponsored Presentation (Opportunity Available)

1:00 Enjoy Lunch on Your Own

Innovative Biological Detection and Challenges (Cont.)

1:55 Chairperson's Remarks

Phillip M. Mach, Analytical Chemist, US Army

2:00 Multifunctional Sensor Platform Enabled by Additive Manufacturing

Mahmooda Sultana, PhD, Associate Branch Head, Instrument Systems Engineering Branch, NASA Goddard Space Flight Center

In this talk, I will discuss our work on multifunctional sensor platform with a suite of environmental sensors fabricated with a variety of nanomaterials using additive manufacturing techniques. The platform is capable of sensing a variety of environmental parameters including pressure, temperature and target gases, and then transmitting the data via a wireless antenna. This technology has numerous space and terrestrial applications.

2:30 Nanotechnology Innovations Converging to Disrupt Multi-Gas Sensing

Sundip R. Doshi, Founder & CEO, AerNos, Inc.

Multiple industries have mission critical needs for affordable, effective multi-gas monitoring capabilities. Breakthroughs in nanotechnology using MEMS circuitry, hybrid nanostructures and signal processing deliver gas sensors that dramatically improve monitoring capabilities. This presentation will use AerNos AerN2S technology to illustrate and explore gas sensor application challenges, including low level detection, size, cross-contamination, calibration, real-time, integration, manufacturing and costs associated with building next-generation multi-gas sensors.

3:00 Introducing High Accuracy Pressure Sensing into the Consumer Medical Space

Robert Robinson, General Manager, Electronic & Gas Sensing Business, Honeywell

With significant advancement in medical technology, many technological firms are beginning to grasp the opportunity to harness real-time medical monitoring from wearables devices. The progression of technology in the medical grade wearable segment is challenging the age-old perception that high accuracy devices should command high prices. This session will discuss how firms can balance between high accuracy features and cost to help them differentiate in the marketplace

3:30 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Tutorials (See page 3 for details.)

6:00 Welcome Reception in the Exhibit Hall with Poster Viewing

7:00 End of Day

WEDNESDAY, DECEMBER 11

8:00 am Registration and Morning Coffee

Plenary Session

8:20 Chairperson's Remarks

Robert Rubino, Senior Director, Research and Development, Integer

8:30 Dexcom's Continuous Glucose Monitoring (CGM) Technology and Its Impact on Diabetes Management, Artificial Pancreas, & Digital Health Systems

Peter Simpson, Vice President of Sensor R&D and Advanced Technology, Dexcom

Recent advances in continuous glucose monitoring (CGM) technology have significantly increased its usability and impact on diabetes management. CGM's are now widely reimbursed and are rapidly becoming the standard of care for people on intensive insulin therapy. This presentation will provide an overview of Dexcom's CGM sensor technology, its use in digital health and artificial pancreas systems and a preview of our future products.

9:00 Objective Measures for Clinical Assessment and Precise Understanding of Disease Progression

Christopher Hartshorn, PhD, Program Director, Cancer Treatment & Diagnosis, National Institutes of Health; National Cancer Institute

This talk will look at various efforts across the National Institutes of Health attempting to enable more objective measures for out-of-clinic, patient-specific assessment and longitudinal understanding of disease progression in large cohorts.

9:30 Wearable Electrochemical Sensors – Recent Advances

Joseph Wang, Distinguished Professor & Chair, Nanoengineering, University of California, San Diego

This presentation will discuss recent developments in the field of wearable electrochemical sensors integrated directly on the epidermis or within the mouth for various non-invasive biomedical monitoring applications. Particular attention will be given to non-invasive monitoring of metabolites and electrolytes using flexible amperometric and potentiometric sensors, respectively, along with related materials, energy and integration considerations. The preparation and characterization of such wearable electrochemical sensors will be described, along with their current status, future prospects, and challenges.

10:00 Coffee Break in the Exhibit Hall with Poster Viewing

10:30 Roundtable Discussions (See website for more details.)

Dealing with Biological Threats

11:25 Chairperson's Remarks

Cory Bernhards, PhD, Research Microbiologist, CBR, Defense Threat Reduction Agency

11:30 The BioACER Sensor: Biological Automated Collector/Detector for Expeditionary Reconnaissance

Cory Bernhards, PhD, Research Microbiologist, CBR, Defense Threat Reduction Agency

We are developing the BioACER sensor, which is a completely novel and fully automated device that conducts remote sample collection (while flying through a plume), preparation, identification, and reporting for biological aerosols within 15 minutes. This unmanned device will allow for low cost, rapid, and accurate identification of biological threats, while eliminating the risk of exposure to operators and allowing for early warning to protect both soldiers and civilian populations.

12:00 pm Nanopore Sequencing for Rapid Identification of Biological Threats in the Field and Biosurveillance

Maria Arevalo, PhD, Research Microbiologist, Defense, Defense Threat Reduction Agency

The warfighter needs quick and relevant information on emerging biological threats that may present themselves in the field. Next-generation sequencing technologies allow for the analyses of whole genomes for unbiased, conclusive identification of pathogens, but can also help to detect and distinguish novel and synthetically modified threats. We are developing rapid sample-to-answer workflows for processing, sequencing, and automated analysis of environmental samples to identify biological threats in the field.

12:30 Sponsored Presentation (Opportunity Available)

1:00 Enjoy Lunch on Your Own

Miniaturized Sensing and Point-of-Care Diagnostics

1:55 Chairperson's Remarks

Cory Bernhards, PhD, Research Microbiologist, CBR, Defense Threat Reduction Agency

2:00 Silicon-Based, Miniaturized Sensing Technologies for Real-Time, Multi-Parameter Monitoring

Winnie Tan, PhD, Senior Manager, Strategic Alliances, IMEC USA

Continuous analysis of biological and chemical substances offers great promises for applications such as environmental monitoring, diagnostics, precision agriculture, food analysis, and process analytical tools for monitoring pharmaceutical manufacturing processes. However, if we want to realize these promises, we need to drastically decrease the cost, size and power consumption of current solutions while increasing their performance. Hence the unique value of semiconductor-based technologies and their opportunities for extreme miniaturization and integration of hardware and software algorithms at the sensor node level. This presentation will give an overview of highly compact, yet extremely sensitive sensor and imaging technologies that can be applied for high-throughput, real-time analysis of biological and chemical substances. Detecting heavy metals, pollutants and even bacteria are all part of our roadmap.

2:30 Biosensors for Use in Point-of-Care Applications

Prasad Pamidi, PhD, Director Sensor Development, Instrumentation Lab, Werfen Company

Biosensors applications are rapidly growing in point-of-care testing. The majority of these sensors are used in single use applications and some of them lack operational simplicity or laboratory quality in accuracy and precision. This presentation will focus on addressing common challenges in developing point of care friendly biosensors and recent options to address such gaps in point-of-care testing.

3:00 Transforming Testing with Saliva

Stan Skafidas, PhD, Professor, University of Melbourne; Co-Founder, CTO, MX3

Peak physical and mental performance is dependent upon optimal hydration. The development of the MX3 test strip represents the first commercially available saliva-based electrochemical biosensor for hydration testing, measuring salivary osmolarity (SOSM), a sensitive indicator of hydration status. Using the MX3 test strip and MX3 Lab hydration status can be measured directly from the tongue in seconds, providing laboratory-grade, actionable results for sports and performance and health and wellbeing.

3:30 Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Tutorials (See page 3 for details.)

6:00 End of Day



Connectivity and Data for Sensors: IOT, AI & More

Enabling Smart Sensors and Sustainable Platforms

THURSDAY, DECEMBER 12

7:30 Registration and Morning Coffee

Plenary Session

8:00 Chairperson's Remarks

Craig Wohlers, Executive Director, Conferences, Cambridge Innovation Institute

8:10 AI to the Rescue: Curing and Augmenting Brain Capabilities with the Smart Kiwi Nano-Implant

Newton Howard, PhD, Professor Neurocomputation and Neurosurgery, Brain Sciences Foundation, Oxford University; Chairman, Board of Directors, ni2o

Brain Computer Interface technologies are in constant improvement with interaction modalities ranging from non-invasive (EEG, TMS, etc.) to chronically implanted devices. We are presenting here Kiwi, a novel, minimally invasive micro-implant using nanotechnologies to record the electrical activity of neural tissue and stimulate using electrical and optical stimulation modalities. Kiwi micro-implant is operating wirelessly and is coupled to a cutting-edge AI module providing the possibility to detect in real-time neural activity patterns and adjust the stimulation parameters accordingly. This adaptive, minimally invasive and smart BCI opens a new way for personalized therapeutic applications in numerous diseases such as neurodegenerative diseases (Parkinsons, Alzheimers, etc.), mental illnesses (depression, anxiety, etc.) or chronic pain, brain augmentation, and research device.

8:35 PANEL DISCUSSION: Sensor Mergers & Acquisitions: Models for Success and Lessons from Failures

Moderator: Andy Gilicinski, Global Vice President, Research Development & Engineering, Mergers and Acquisitions, Johnson & Johnson

This panel discussion will examine the current landscape of mergers and acquisitions with the sensors and device space. Our panel of experts will discuss the current outlook within the marketplace and will examine past success and failures and how the pitfalls of failure can be avoided.

9:25 Coffee Break in the Exhibit Hall with Poster Viewing

5G Implications for Hardware

10:00 Wrapping Your Head around 5G: A Primer for the Enterprise Community

Joshua Ness, Senior Manager, 5G Labs, Verizon

Learn how 5G will transform Enterprise IoT and enable technologies that will spur a revolution in device technology and information access.

10:30 Review of the Field: 5G, IoT, and More

Rajan Mistry, Staff Engineer, Qualcomm

IoT Platforms for Diagnostics and Remote Monitoring

9:55 Chairperson's Remarks

John Koon, Technology Editor/Writer/Researcher, Tech Idea Research

11:00 Review of Data Analysis and Model Classification Techniques for Olfactory IoT Platforms

Luisa Bozano, PhD, Manager, Nanoscale Fabrication Group, IBM Almaden Research Center

A discussion of the varied data analysis and machine learning techniques that enable IoT platforms for olfaction. The review will touch on the versatility of techniques applied to olfactory platforms to preprocess, model and classify odorant patterns. It will also present challenges of the data from these systems and an outlook of opportunities for connectivity in use-case applications.

11:30 Wearables and Remote Patient Monitoring

Walt Maclay, President, R&D, Voler Systems

Remote patient monitoring is developing into a new standard of care. Remote monitoring capabilities are already enabling more convenient care, resulting in better patient outcomes and allowing physicians to serve patients more effectively. Supporting this shift is the availability and affordability of sensors that perform physiological measurements, wireless technology and connectivity necessary to support remote monitoring programs.

12:00 pm Sponsored Presentation (Opportunity Available)

12:30 Enjoy Lunch on Your Own

Building for AI

1:25 Chairperson's Remarks

John Koon, Technology Editor/Writer/Researcher, Tech Idea Research

1:30 AI at the Edge: A Review of Toolsets Available when Building an Edge Device

Sai Yamanoor, IoT R&D Applications Engineer, Praxair

Organizations are deploying IoT devices at an exponential scale to better serve their customers, and there is a growing need for edge devices. This is driven by a need to reduce recurring costs like cellular data charges, provide alternatives when there is poor connectivity, or react immediately to a critical sensor input, and avoid loss of productivity, identify anomalies (e.g.: leak detection) in data streams, etc. In this session, we will demonstrate the different hardware and software toolsets available to build an edge device and walk the audience through the different steps involved in building an edge device. We will also talk about the challenges involved in building and testing an edge device.

2:00 PANEL DISCUSSION: Best Practices for Data Storage and Processing

Moderator: Laura Kassovic, CEO & Co-Founder, Mbientlab

Panelist: Tilak Kasturi, Founder & CEO, Predii

With billions of new devices, AI or IoT-enabled sensors are transforming the field. However, without the right data management strategy and tools, investments in AI and IoT can yield limited results. Learn more about some of the data management best practices and how organizations are using advanced analytics and machine learning to enable AI and IoT use cases.

3:00 Refreshment Break in the Exhibit Hall with Poster Viewing

AI for Patients

3:30 Using Health Records to Enable AI in IoT Devices

Sujay Kakarmath, Digital Health Scientist, Partners HealthCare Pivot Labs
IoT devices geared towards general wellness as well as specific diseases generate a high volume of data. These data have limited utility of their own accord as they are devoid of any context about clinical or healthcare utilization outcomes. The Data Science and Artificial Intelligence team at Partners Healthcare Pivot Labs has helped enable AI in healthcare IoT devices by leveraging EMR data from a large healthcare delivery network to supplement IoT device data. This presentation will share examples from current and past collaborations.

4:00 PANEL DISCUSSION: Legal Versus Ethical Data: Sensors for Healthcare

Moderator: Deborah Peel, Chair & Founder, Patient Privacy Rights Foundation

Panelist: Adrian Grooper, CTO, Patient Privacy Rights Foundation

Which data is private? Heartbeat? How can patient privacy be defined and protected on connected medical equipment and what are the associated rights of that patient? Are manufacturers obligated to disclose all data being collected and its usage? Are the data collected adequate and properly validated for the intended uses? What consumer protections exist to protect patients in the event of potential discrimination or data misuse?

5:00 Close of Summit

HOTEL & TRAVEL INFORMATION

Conference Venue and Hotel:
Hilton San Diego Resort and Spa
1775 East Mission Bay Drive
San Diego, CA 92109
Phone: 619-276-4010

Discounted Room Rate: \$165 s/d plus \$8.00 resort fee
Discounted Reservation Cutoff Date: November 19, 2019

RESERVATIONS:

Please visit the travel page of SensorsGlobalSummit.com for further details and to book your stay.

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- Save money – take advantage of the deeply discounted room rate and resort fees.
- When you book in the group block, your resort fee will be reduced to \$8 per night from the standard \$32
- No commute and a chance to easily network with fellow attendees on property after hours
- Get a chance to enjoy beautiful Mission Bay
- Easy access to many of San Diego's popular attractions including San Diego Zoo, SeaWorld, and Old Town San Diego