SMART MedTech

C. Melvin
Director of Operations
Semi Europe, Berlin, Germany

Biography
Cassandra Melvin received her BS in Business Management and Neuropsychology at Rensselaer Polytechnic Institute and is Director of Operations at SEMI Europe. For the nine years prior to joining SEMI, she held the position Global Product Manager at Atotech Deutschland GmbH, where she was responsible for managing several hundred electroplating chemistry products in its Semiconductor and Functional Electronic Coatings division. She began her career at the SUNY Polytechnic Institute (formerly the College of Nanoscale Science and Engineering) as a Business Manager focused on strategic and technical programs for semiconductor chemistry and equipment manufacturers. She also held various project and program management roles in clean room operations and IT at SUNY. Cassandra's written work has been published in leading technical magazines and presented at key conferences globally. As an advocate for diversity and inclusion, she is actively involved in SEMI's efforts to promote diversity within the semiconductor industry.

From Disease Care to Health Care

B. Wiegand
Global Head, World Without Disease Accelerator
Johnson & Johnson, Raritan, United States

Abstract
Over the last 200 years, there has been significant advances in average life expectancy. At the same time, there has been an increase in the number of chronic conditions that we have as we age. So, in some sense, we are living, longer, unhealthier lives. What if we could predict who was going to get disease and then pre-empt it from happening? That vision could lead to a world without disease. This presentation will discuss strategies to live into this vision, and potential steps toward achieving it.

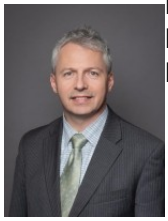
Biography
Benjamin C. Wiegand, Ph.D. is the Global Head of the World Without Disease Accelerator, Janssen R&D. This effort is a critical element in Janssen’s efforts to catalyze a new paradigm in health care, with the potential to capitalize on the expertise across all of J&J. The focus of the World Without Disease Accelerator is to address the root cause(s) of disease, and then either prevent, intercept and cure the disease. This will lead to interventions much earlier than today’s clinically accepted point of diagnosis and will lead to the eradication of the targeted disease. These efforts require both technical and business model innovation to create this new healthcare paradigm.

As the leader of the WWD Accelerator, Ben is responsible for developing and implementing strategies that will deliver solutions in a World Without Disease paradigm. Today, the focus of the WWDA is on three areas, Lung Cancer, Type 1 Diabetes and Colorectal Cancer. In addition, his team has expertise in six critical

enabling capabilities, Immunosciences, Microbial Therapeutics, Sensors & Wearables, Gene Editing, Data Sciences, and Behavioral Neurobiology, which are coupled with digital technologies to activate and change the trajectory of health for consumers around the world.

Ben has worked at Johnson & Johnson for over 20 years, with experiences in a wide range of the Johnson & Johnson Consumer businesses. He has a broad range of experience in both short term product development as well as long term innovation. In that role, he was named a 2008 Johnson Medal recipient for his work on key behavioral studies of the effect of rituals in improving infant sleep behaviors.
Ben holds a B.S. degree in Chemistry from the University of Illinois, and both a M.A. and Ph.D. in Physical Chemistry from Harvard University.

Perspectives on Healthcare, the Medtech Industry, and Digital

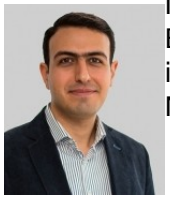


M. Strübin
Director Digital Health
MedTech Europe, Brussels, Belgium

Abstract
Healthcare represents one of the biggest sectors in advanced industrialised countries (the OECD average in 2017 was 8.8 percent of GDP), yet as a market it may be one of the most complicated to access: fragmentation, the strong role of the public sector, the high level of regulation, the often competing interests of powerful stakeholders, and other factors make life difficult for industry. New regulations for medical devices and in vitro diagnostic devices, enacted in 2016, will come into force in the coming years. And advances in technologies, especially in digital, have the potential to change and upend the doctor-patient relationship. These and more developments will be covered in this keynote from MedTech Europe, the largest trade association for the medtech industries in Europe.

Biography
Michael Strübin joined MedTech Europe as Digital Health Director in 2018 to help develop the industry's voice in the digital health field and to represent MedTech Europe's members vis-à-vis digital health policymakers and stakeholders.
Prior to MedTech Europe, Michael ran the European operations of the Continua Health Alliance (renamed Personal Connected Health Alliance in 2014), an international association of health and technology companies, governments and research organisations to advance personal connected health. Between 2006 to 2008, Michael was the first European Director of the Health Information and Management Systems Society (HIMSS).
Michael studied political science and humanities in Germany and the United States, and worked in international development and philanthropy. Since 2003 he has been based in Brussels.

Connected Health for a Bright Future



N. Shahriari
Business Developer
imec, Connected Health Solutions, Eindhoven, Netherlands

Abstract
The world of diagnostic testing and chronic disease management is undergoing rapid changes. High-precision wearable and connected health sensors start rivaling expensive bed-side devices in terms of quality and diagnostic insight. In the past few years imec has developed a number of such connected health sensors and we are continuing to do so. The development of these connected health sensor platforms is strongly application driven and requires innovative technology development to ensure reliable, medically relevant operation in realistic use cases. One of the driving factors behind this innovation is novel circuits enabling multi-modal high-precision data collection and analysis at ultra-low power consumption. This talk will discuss the ASIC and SoC platforms imec is currently working on for various diagnostic and chronic disease management applications both in the wearable and connected space as well as in the implantable space.

Biography
Navid Shahriari is Business Development Manager for Connected Health Solutions at imec. He joined imec as a biomedical algorithm designer but soon was fascinated by the growth opportunities for the innovations he was developing. He later joined the business development team. Navid holds an M.Sc. degree in Artificial Intelligence and Robotics from the Sapienza University of Rome, Italy and a Ph.D. degree in Surgical Robotics from the University of Groningen, the Netherlands. In his free time, he enjoys cooking or reading a good book, and he will never say no to a ski trip.

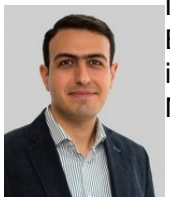
Bridging the Gap from Semiconductors to Medical Technologies: GE Research Advances in Multiparameter Gas, Physiological, and Biological Sensing

R. Potyrailo
Principal Scientist
GE Research, Niskayuna, NY, United States

Abstract
Modern monitoring scenarios for biomedical, biopharmaceutical, and personal wellness applications demand sensors with higher accuracy, enhanced stability, and lower power; all in unobtrusive form factors and at a low cost. Unfortunately, available sensors based on traditional detection principles are often inadequate in accuracy, stability, power demands, and convenience. It does seem that existing sensing concepts are reaching their fundamental performance ceilings. These limitations of available sensors drive the innovative designs of new generation of sensors.

In our talk, we will discuss how technological advances in diverse segments of the semiconductor industry positively impact designs and performance of innovative types of gas, physiological, and biological sensors. We will present examples from our recent programs at GE Research where we focus on new principles of sensing based on multiparameter signal excitation and detection. We will demonstrate how these advances were achieved and implemented by utilizing diverse semiconductor processes. These developments resulted in sensors with previously unthinkable performance characteristics in wearable, stationary, and other form factors. As examples, we will illustrate the capabilities of these sensors to independently quantify different environmental, physiological, biological, or bioprocess parameters, to reject interferences, and to enhance sensor-response stability. Conventional and innovative semiconducting processes have played a major role in achieving our new performance characteristics.

Biography
Dr. Radislav Potyrailo is a Principal Scientist at GE Research, leading the growth of wireless and wearable chem/bio sensors for diverse applications. Radislav has been Principal Investigator on programs funded by GE, AFRL, DARPA, DHS, NETL, NIH, NIOSH, and TSWG. Some of these results Radislav summarized in 125+ granted US Patents and 150+ publications on transducer technologies, sensing materials, and data analytics describing sensing concepts and their implementations. He has delivered 80+ invited lectures and ten keynote/plenary lectures at national and international conferences and coauthored/coedited eight books. Examples of his contributions to scientific community include serving as the Chair of the MEMS and Sensors Industry Group (MSIG) Device Working Group, as the North America Regional Chair of International Society for Olfaction and Chemical Sensing, the initiator and a co-organizer of the First Gordon Research Conference on Combinatorial and High Throughput Materials Science, and as the editor of the Springer-Nature book series Integrated Analytical Systems. His recent recognitions include SPIE Fellow and Prism Award by Photonics Media/SPIE.



N. Shahriari
Business Developer
imec, Connected Health Solutions, Eindhoven, Netherlands

Biography

Navid Shahriari is Business Development Manager for Connected Health Solutions at imec. He joined imec as a biomedical algorithm designer but soon was fascinated by the growth opportunities for the innovations he was developing. He later joined the business development team. Navid holds an M.Sc. degree in Artificial Intelligence and Robotics from the Sapienza University of Rome, Italy and a Ph.D. degree in Surgical Robotics from the University of Groningen, the Netherlands. In his free time, he enjoys cooking or reading a good book, and he will never say no to a ski trip.

Digital Health: Tracking Mental Stress and Mood Using Wearable Data and Machine Learning

E. Rios Velazquez
OnePlanet | Connected Health Solutions, Leuven, Belgium

Abstract
Through wearable technology and digital footprints on our mobile phones, social media, etc., we can extract valuable insights on our lifestyle and well-being. imec is developing new tools to encourage behavior change towards a healthier lifestyle, that may lead to new therapeutic tools for patients with mental health problems such as depression or eating disorders.
Through habit monitoring, physiological monitoring, and personalized, intelligent algorithms we aim to identify triggers of unhealthy behavior, increase awareness and contribute to preventive health.
This talk will touch on data-driven machine-learning enabled applications linking wearable data and mental health.

Biography
Emmanuel is a data scientist engaged on the identification of relevant patterns of physiology and brain activity to assess cognition, mood and behavior through wearable technology, at imec's Connected Health Solutions team.
Emmanuel received a PhD from the Maastricht University, on the use of heterogeneous patient data and computational imaging (radiomics) for decision-support systems in radiation oncology.
This pioneering work led to diverse multi-centric, international scientific collaborations. This was followed by a post-doctoral degree at the Computational Imaging and Bioinformatics lab at the Dana-Farber Cancer Institute-Harvard Medical School, investigating the link between cancer imaging phenotypes and tumor biology for precision medicine.
Besides crunching data, he likes reading (contemporary novels), playing drums and whenever possible going to the sea.

Can Wearables Help Prevent the Silent Killer, Blood Pressure?

S. Mulpuru
Director, Business Management, Industrial & Healthcare
Maxim Integrated, San Jose, United States

Abstract

Biography

Sudhir Mulpuru joined Maxim Integrated in 2013. He has more than 20 years of experience in the electronics and software industry in roles ranging from sales to product management. In his current role, he is responsible for Maxim's sensors solution initiatives for fitness and wellness wearables. Sudhir Mulpuru holds a Bachelor's degree in electronic engineering from the Osmania University, India and a Master's in Business Management from the University of New Hampshire, USA.

Sensors to Enable Consumer Health Applications

F. Frederix
Senior Marketing Manager Smart Medical Devices
ams, INS, Berchem, Belgium

Abstract

Healthcare costs are rising due to an aging population and with decreasing funds from governments and insurance companies, our society needs to implement efficient healthcare solutions and more critically, pay more attention to prevention, early diagnosis and remote monitoring. This explains the recent rise of consumer health solutions. In this abstract, we will discuss the requirements related to the sensor technologies in medical-grade devices. We will demonstrate various technology approach options in the field of point-of-care (POC) diagnostics and portable consumer health devices. To take full advantage of preventative care, it is important that people are able to frequently monitor their health status. Research shows that monitoring tools must be easy to use, non-evasive and connected, with the ultimate goal is for these tools to be used at home or at the GP´s office. POC testing or rapid tests have the potential to solve these challenges. A relevant example is the commonly used home pregnancy tests, which are based on the lateral flow testing principle. At ams, we developed an electronic/optical readout for these tests to boost the sensitivity and enable multiplex capabilities. We will highlight a first prototype of this technology and its performance. We will also present the VivaVita, which is a result of a corporation between Joysys and ams. We will explain the working principle, the specifications and the applications. The VivaVita device allows generating medical quality data at a consumer level or outside a hospital setting. The VivaVita measures heart rate variability, ECG and blood pressure with a small, portable and fully integrated device. It is operated in a consumer friendly way, it is cost-effective and enables wireless data transfer and wireless charging. The core of the device is the AS7026 module, which is a low power, fully integrated optical module that allows for photo plethysmography (PPG) measurements in a reliable way.

Biography

Filip Frederix has worked for more than 20 years in the field of nanotechnology for healthcare products and is author of several publications and patents. Filip joined ams in October 2017 to spearhead the ams marketing efforts for Smart Medical Devices within the Imagine New Sensor Division. With a proven track-record in starting new business opportunities, Filip´s background includes working as an independent consultant supporting life sciences startups with capital raising and their business strategy. The largest part of his career was spent at NXP as a program director and new business development manager for healthcare products. In 2004 Filip won the prestigious DSM award, where he continued to work on emerging business projects at DSM in the Netherlands. While working as a post-doctoral researcher at IMEC, he earned his PhD degree in Chemistry from the University of Leuven in 2004. He serves as part-time professor at the University of Hasselt (since 2013).

H. Leistner
Team Leader | Micro Dosing Systems
Fraunhofer EMFT, München, Germany

Biography

Henry Leistner is holding a Master's degree in Semiconductor Physics and in Industrial Engineering. His

previous research activities focused on yield enhancement methods at X-FAB Silicon Foundries. Further he investigated improvement strategies in customer supply allocation with machine learning at Infineon Technologies. Since 2018, he has been leading a team of the Micro Dosing Systems department of Fraunhofer EMFT, covering a broad range from applications, feasibility studies and consulting activities in medical technology (e.g. artificial pancreas, insulin patch pumps) to consumer electronics (e.g. environmental sensors in smartphones). Additionally, he is pursuing a PhD in Electrical Engineering at Technical University of Munich.

Personalized Medicine: Toward Innovative Solutions to Meet Healthcare Challenges

J. Mouly
Senior Analyst & Business Developer
Yole Développement, Villeurbanne, France

Abstract
Healthcare is moving towards profound transformation for better performance of medical care while reducing the cost. To reach objectives, healthcare system needs innovative solutions and disruptive technologies placing the patient in a more centric approach.
Everything is starting from personalized diagnostics, leading to development in next generation sequencing (NGS) or liquid biopsy, the latter being a key enabler of personalized medicine in cancer care, taking into account the uniqueness of individuals in gene variations but also in environment and lifestyle.
Pharmaceutical companies are very active in this field to generate precision drugs delivered at the right concentration, to the right patient and at the site of the disease. These companies have established strong networks with NGS company solution providers like Illumina or Oxford Nanopore to accelerate personalized drug discovery. The fleet of sequencing instruments is expected to more than double within a period of 5 years. At the sequencing flow cell consumable, it will be about 4.2 million units to be sold in 2024 with a compound annual growth rate of 21% from 2018 to 2024.
Huge amount of data will be created by an increasing number of diagnostic tools, including also medical wearables, collecting patient vital signs. Sensors are key parts of the diagnostic instruments requiring high sensitivity, reliability and selectivity to reach medical grade. Closed-loop insulin pumps are an example of personalized and precision medicine applications adjusting the drug delivery to the patient needs, thanks to the connected sensor worn on the patient's body.
The presentation will unveil the latest development contributing to increase personalized and precision medicine approaches, with key technologies trends and related challenges, reinforcing the link between technology and medical world.

Biography
Jérôme Mouly serves as a Senior Technology & Market Analyst & Business Developer specialized in microtechnologies within the Photonics & Sensing activities at Yole Développement (Yole). Jérôme is supporting the development of strategic projects, following leading customers of the company.
Since 2000, he is also engaged in more than 100 marketing and technological analyses for industrial groups, start-ups and institutes in the field of MEMS, BioMEMS, wearable & connected medical devices. Through its numerous activities at Yole, Jérôme is covering the whole microelectronic supply chain including manufacturing processes and devices development.
Jérôme is also regularly involved in international conferences, giving presentations and delivering keynotes.
Jérôme Mouly holds a Master of Physics from the University of Lyon (France).

Personalised Health Management Enabled by Nanotechnology and Laboratory on a "Chip" Products

R. van't Oever
CEO
Micronit, Enschede, Netherlands

Abstract
Medical devices and personalised diagnostics are increasingly enabled by micro and nanotechnologies. In the recent decade semiconductor and MEMS related technologies have been used to develop products that solve the problems of today's society. The maturity level of the industry has progressed significantly and the tools are now ready to realise an enormous impact and possibly even disrupt the way people stay healthy. The market is moving from healthcare for people that are already ill to prevention and health and wellbeing management. A few examples of the exponential development in the market will be discussed as well as the challenges in bringing a product to market in health related industries. Developments in DNA sequencing, single cell analysis, lab on a chip and organ on a chip are changing the way individuals manage their health now and in the future. A whole new industry that uses nanotechnology based solutions applied to health and wellbeing applications is emerging. In order to be successful, the ease of use and level of integration of a product has to allow non-expert users to work with it. True sample-to-answer solutions are required. In a lot of cases the sensors are made out of semiconductor materials, however the sample preprocessing requires larger volumes of liquid which makes other materials like polymer and glass more cost effective options. Examples will be shown to demonstrate how workflows can be integrated in a single product.

Biography
In 1999, Ronny van 't Oever co-founded Micronit. Since 2011, today he serves as Chief Executive Officer for the company. Prior to starting Micronit, Ronny began his career at the Abbott Diagnostics Division in Santa Clara, California.
With a passion to bring innovative products to the market, Ronny recognizes the need to connect government, research institutes and industry. Therefore, he currently holds the position of President of MinacNed, a Dutch trade association aiming to strengthen the economic activity based on microsystems and nanotechnology.

Ronny van 't Oever graduated with a master's degree in Physics at the University of Twente in Enschede. In 2007, he was awarded 'Engineer of the year' in the Netherlands.

Medical is the next Automotive – the Advance of Silicon-based Microfluidics Technologies and Applications

S. Ernst
X-FAB MEMS Foundry, Erfurt, Germany

Abstract
Silicon-based Microfluidics have paved the way for the advent of various new applications and technologies for the bio-medical market, such as next-generation DNA sequencing and synthesis, chip-based disease detection, lab-on-chip or cell arrays. Increasing requirements in system complexity and data handling demand for a growing level of integration. At the same time, the application space is highly fragmented, technology concepts and supply chains are complex and application-specific, and development cycles are typically very long. In order to overcome the related technical and commercial challenges for the industrialization, a scalable business model is required – based on standardization of the manufacturing process and design cycle.

Biography
Stefan Ernst, born 1980, holds a PhD in Physics from Dresden University of Technology.
He joined X-FAB in 2011 and worked in various positions in Technology Development. Since 2017, Stefan is in charge of Product Marketing and Strategy at X-FAB's Business Unit MEMS.

P. Boisseau
Director EU R&I Partnerships Policies
MedTech Europe, Brussels, Belgium

Biography
Patrick Boisseau is the Director, EU Research & Innovation Partnership Policies at MedTech Europe, the EU association of medtech and in vitro diagnostics industries, based in Brussels (Belgium). He is a core member of the Inter Association Task Force setting up the future Public Private Partnership on Health Innovation under Horizon Europe.
Until recently Patrick was VP Europe at CEATech Healthcare Institute, based in Grenoble (France). He managed a significant number of EU collaborative projects, research infrastructures, coordination actions and networks of excellence for the past 20 years. His scientific and technical expertise focuses on innovative medical technologies.

The Digital Patient: Will We One Day Have our Own Health Avatar?

G. Janssen
Department Head Multiphysics & Optics and
Program Manager Patient Digital Twin
Philips, Eindhoven, Netherlands

Abstract
A digital twin is a virtual representation of its physical counterpart, bringing together all relevant data of the physical part – preferably continuously updated with new data - and adding an intelligence layer on top of it to extract extra insights and predict future performance or issues. Whereas digital twins for devices or equipment are already known for some time in industries like Aerospace, Automotive and Energy, it's a relatively new concept in Healthcare. This is certainly true if we translate the digital twin concept to patients. In this presentation we will dive into this concept of patient digital twin, sketch a future vision on its applicability and how it can transform the healthcare industry. Since apart from big promises there are also big challenges, not only the vision and current status of developments will be discussed, but also the challenges that must be overcome and the limitations that we need to take into consideration.

Biography
Ger Janssen has a PhD in Applied Physics from Eindhoven University of Technology in the Netherlands. He joined Philips in 2001 where he started as thermal expert and continued his career in different roles, from project leader to group leader to department head. In all his responsibilities computational modelling is the recurring theme, in which he has now over 20 years of experience. He is currently head of the newly formed Digital Twin department in Philips Research and since 2018 also Program Manager Patient Digital Twin. In these roles he is shaping the digital twin activities of Philips.

The Future of Personalized Treatment

F. Laermer
Research Fellow (Senior Chief Expert)
Robert Bosch GmbH Stuttgart, Corporate Sector Research & Advance Engineering, CR/AR1 CE-MST, Renningen, Germany

Abstract
Molecular Diagnostics opens deep insights into the root-causes of many diseases. However, related processes are cumbersome, time-consuming and expensive. We are introducing VIVALYTIC, an open platform for the automation of complex molecular diagnostics workflows which will relieve this burden and take molecular diagnostics to the point of care. This is achieved by miniaturization, microsystems assembly and integration, and automation technologies. In future, we are convinced that our solutions will enable a paradigm shift in medical treatment, away from the "one drug fits all"-approach towards personalized and targeted therapies in a "the right drug for the right patient"-approach.

Biography
Dr. Franz Laermer joined the Corporate Research and Technology Center of Robert Bosch GmbH, Stuttgart, Germany, in 1990, where he started the development of new key technologies and sensor functions for the upcoming field of Micro-Electro-Mechanical Systems (MEMS) at Bosch. His activities were mainly focused on new microstructuring, surface-micromachining and sacrificial layer etching technologies, as well as micro-accelerometers, gyroscopes and pressure sensors for the automotive area.

Dr. Franz Laermer managed a number of projects which laid the foundation for many generations of microsensors at Bosch. Since 2003, he is Project Director for TOP-level innovation projects covering new application fields beyond automotive, including the biomedical area. Since 2009, he is Project Vice-President (PMP) and Chief Expert for Microsystems, Microfluidics and Molecular Diagnostics. His work laid the foundation for the VIVALYTIC Diagnostics Platform of the newly founded Bosch Healthcare Solutions (BHCS) Business Division. In 2018 he was established as the first **Research Fellow** at Bosch.

Dr. Franz Laermer is the co-inventor of the "**Bosch Deep Reactive Ion Etching Process**" (“BOSCH-DRIE”) for microstructuring silicon. This key microstructuring technology revolutionized MEMS and is the root of all of today’s silicon based MEMS. He holds more than 200 patents.

Dr. Franz Laermer was awarded with the prize “**European Inventor of the Year 2007 – Category Industry**” by the European Commission and the European Patent Office (together with co-inventor Andrea Urban), for the invention, development and sustainable success of the “BOSCH-DRIE”-process. In 2014 he received the “**2014 IEEE Jun-ichi Nishizawa Medal Award**” from the Institute of Electrical and Electronics Engineers (IEEE), USA.

The Clinician’s Point of View

A. Mathur
Director of Interventional Cardiology, Bart's Heart Centre
Bart's Heart Centre, London, United Kingdom

Abstract
Artificial Intelligence and Virtual Reality are already relied upon by clinicians in interventional cardiology. 3D printing, simulated therapeutic results, anatomical and physiological models, computer generated reconstructions and augmented reality are all part and parcel of a clinician’s daily life. However, our current overarching approach to cardiovascular disease involves silos of care based on prevention, diagnosis, treatment and rehabilitation. There are few tools that allow a holistic, individually tailored approach to these segments. Consortia have a wealth of healthcare data which target these important areas in isolation, rather than linking them across the interactions of a human lifetime. Further, the available data regarding intervention, whether it is prevention, treatment or recovery, is difficult to tailor to the individual in the absence of bespoke sensing technologies linked to proven algorithms. Therefore, there is a pressing demand to amalgamate our data, unify our latest (and future) scientific and engineering research, and apply it to personalised healthcare. We can break the cycle of only reacting to the patient’s heart condition at the point of discovery (cardiac event) by unifying innovative clinical and computational understandings of cardiovascular diseases to develop integrated tools to reveal potential disease pathway years in advance. These unified digital solutions can then be used to guide the actions of the individual, alongside the professional, to manage heart health in radically new pathways. The individual is empowered to identify their risk, recognise their lifestyle challenges, and receive the focussed interventions they need. Our proposal is that human avatars will become Digital Twins – heralding pioneering computational and technological vehicles which wholly represent the human individual and their cardiovascular status, be it in the prediction, prevention, diagnosis, treatment or rehabilitation of cardiovascular disease.

Biography
Anthony Mathur has been a Professor of Cardiology at QMUL & Barts Health Trust since 2009, and leads their Centre for Cardiovascular Medicine and Device Innovation. He is also the Director for Interventional Cardiology and the Head of Interventional Cardiac R&D at Barts Health. Further, he is an adjunct Professor for the Department of Medicine, Yale. Anthony has also sat on several international advisory boards, including chairing the ESC Task Force for stem cells in cardiovascular disease, as well as advising the UK Department of Trade and Industry and the House of Lords Select Committee on cell therapy. Alongside these positions, he regularly reviews papers submitted to Circulation, Heart, the Lancet, and Thrombosis and Haemostasis.

Anthony specialises in interventional cardiology and the management of heart failure patients who have failed conventional therapy. He aims to develop new techniques and devices to treat these patients who fall outside the remit of current recognised therapies. His research interests primarily concern the role of stem cells in the treatment of cardiovascular disease and, to date, his research has received over £25m in funding. Of this, £15m was for translational research. Several of his programmes have international recognition, including an adult heart stem cell research programme, and a novel stent development programme. Moreover, he leads a collaborative group with Prof. John Martin (UCL) seeking to address the role of stem cells in the treatment of cardiovascular disease. This partnership has led to the establishment of a large series of clinical trials translating the interesting results produced by basic experimentation, into relevant therapeutic approaches in man. Anthony is currently the CI for one of the first Phase III trials of cell therapy in acute myocardial infarction. Alongside this, he is a Trustee of the Heart Cells Foundation Charity and heads their pioneering Compassionate Treatment Unit for Heart Failure. This dedicated stem cell programme is the

UK’s only centre to treat compassionate heart failure patients with their own stem cells.

Anthony is also interested in the use of advanced cardiac imaging, particularly in examining the mechanistic aspects of translational research, and was Barts’ Lead Clinician for Advanced Cardiac Imaging. He chairs a joint imaging board, linking Barts’ radiology and cardiology departments, which has assembled a state of the art collection of advanced imaging hardware composed of: cardiac MR, PET/CT, cardiac CT, nuclear perfusion and advanced echo.

Within the Centre for Cardiovascular Medicine and Device Innovation, and as part of an on-going collaboration with Yale University, Anthony raised £6m in EU grant funding to create a Cardiovascular Devices Hub. The Hub supports collaborations between academic, clinical and industrial innovators to develop clinically and commercially viable cardiovascular devices. This novel, cross-specialty unit helps SMEs over the hurdles involved in taking new innovations to human trials, thereby catalysing innovation.

G. Heidenreich
Director for Healthcare IT Standards
Siemens Healthineers, Erlangen, Germany

Biography
Dr. Georg Heidenreich is with Siemens Healthineers, where he holds the position of Director for Healthcare IT Standards.
In that role, he serves as chairman of the German national committee to IEC 62A (Electrical Safety of Medical Devices) and of the medical cybersecurity workgroup of ZVEI. As the co-convenor of IEC/ISO JWG7 (Safety, effectiveness and security of clinical IT-networks)
he is writing a new process standard ISO 80001-5-1 on medical device cybersecurity.
Georg is member of the German Informatics association (GI), HL7 Germany and helped create the Association for Software Quality in Franconia (ASQF). He holds a diploma in Computer Science and received a doctoral degree in Engineering from Erlangen-Nuremberg university.

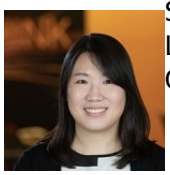
Lymberis Andreas

A. Lymberis
Head of Sector Wearables and Bioelectronics
European Commission, Brussels, Belgium

Biography

Andreas Lymberis is a physicist, post-graduated with a Ph.D. in biomedical engineering and sciences (1990, Paris, France). He worked for more than 20 years as researcher/engineer and R&D manager in biomedical technology and health telematics. In 1999 he joined the European Commission (Brussels, Belgium) as a scientific officer in eHealth where he initiated R&D activities on “smart wearable health systems and biomedical clothing”. Since 2004 he is senior research program officer in electronic components and systems. In 2016 he has been appointed as head of sector "Wearables and Bioelectronics". He is Senior IEEE Member and chaired the IEEE-EMBS Technical Committee on Wearable Biomedical Sensors and Systems (2004-2007). He published over 60 articles in journals, conference proceedings & books and he is editor of 2 books on wearable and mobile health systems.

Cho Sanghee



S. Cho
Lead Scientist Controls and Optimization
GE Research, Niskayuna, NY, United States

Biography

Dr. Sanghee Cho is a Lead Scientist in Controls and Optimization group at GE Research. She Joined GE in 2014 after obtaining her Ph.D. in Statistics from Yale. At GE, Dr. Cho used her deep knowledge in Statistics to tackle a wide range of industrial challenges ranging from oncology, industrial asset performance & reliability, and quantification of financial risk. For the past two year, Dr. Cho has been a key member of multiple government-funded program where she leveraged her expertise in data analytics to analyze single cell data from multiplexing images on different cancer types.

GE Research is a multi-disciplinary R&D center leading the digital transformation of industrial fields and providing innovative biomedical solutions for diverse healthcare applications, including bioelectric medicine, medical imaging, predictive medicine, monitoring and molecular diagnostics. The recent evolution of AI-based modeling and image analytics has enabled the development and implementation of new approaches in medical image analysis. The data extraction of biomarkers and features, in concert with genomics and proteomics, has unlocked a new era in therapy, diagnosis and prognosis. The use of AI/ML, enabled by big data analytics, will lead to the discovery of disease mechanisms, and contribute to better prognosis models, improving the prediction of therapy response and diagnostics. GE Research is taking a thought leadership position by supporting the fundamental research of how AI/ML will guide personalized medicine, cancer treatment, and the role of cyber security in delivering medicine in trusted transactions.

Vandebrouck Laurent

L. Vandebrouck
Chief Executive Officer
Chronolife, Paris, France

Biography
Laurent Vandebrouck is Chronolife's Chief Executive Officer and was Managing Director Europe Qualcomm Life before prior to that. He has 25 years of experience in the development, launch and operation of end-to-end services for enterprises among which 8 years in digital health, remote patient monitoring and connected therapies for the Pharma, MedTech and large integrators, service providers and HCPs in Europe and in the US.

A. Van den Bosch
Director Public R&D Policies and Programs
Imec, Leuven, Belgium

Biography
Anne Van den Bosch obtained her master degree at the Catholic University of Leuven in 1995 and her PhD degree in 2003 in the area of current steering digital-to-analog converters. She is first author of 17 publications and co-author of 5 publications and has been reviewer for IEEE. From 2001 until 2008, she worked for the Flemish funding agency where she coordinated the micro-electronics and photonics team and where she represented the agency in the MEDEA+/CATRENE and ENIAC public authorities board. She is now working at imec as Director Public R&D Policies and Programs and coordinates all activities within imec relating to Flemish and international public research policy and programs including the collaboration with research institutes. She is member of several commissions and steering committees.

CMOS Compatible SiN Photonics Platform for Life Science Applications

A. Stassen
Process Integration Engineer
imec, Life Science Process Integration, Leuven,
Belgium

Abstract
Integrated photonics technology offers extensive miniaturization possibilities for life science instrumentation. Especially with the development of SiN photonics, devices operating in visible to near-infrared wavelength regime has been fabricated. At imec we have developed a novel SiN photonics technology platform that is comprised of PECVD deposited photonic stack. Low temperature deposition of the stack allows monolithic integration of the integrated circuits on CMOS imager wafers, which offers novel application capabilities. Target applications for such devices are labelled or non-labelled sensing of biomolecules, cells and tissues. In order to enhance the fluorescence sensing capability of the platform, SiN material properties are further optimized towards obtaining low auto-fluorescence and low optical loss values. In addition, the platform is extended by developing new modules such as focusing grating couplers and integrated sensing windows. Consequently, fabrication of devices for fluorescence sensing applications based on imec SiN photonics platform were successfully demonstrated.

Biography
Born in 1982, Istanbul, Miss Andim Stassen completed her M.Sc. degree in Nanoscience and Nanotechnology in Katholieke Universiteit Leuven during 2009-2010 academic year. As a doctorate student she continued her studies in Katholieke Universiteit Leuven under the supervision of Prof. Liesbet Lagae. She has been working as part of Life Science Technologies Department as process integration engineer since 2014. Served as a co-author in numerous research articles, she has been working on wide range of topics including Si microfluidics, SiN photonic design and manufacturing, microfluidics and CMOS integration of the SiN photonics platform for visible light applications. In her PhD research she investigates novel measurement techniques of single cell activity via electronic and photonic platforms.

Microfluidic, CMOS Microelectrode Array-based Organ-on-chip System: a Platform for Personalized Medicine

T. Pauwelyn
Postdoctoral Researcher
imec, Life Science Technologies, Leuven, Belgium

Abstract
Healthcare has traditionally focused on one-size fits-all medication to treat populations instead of tailoring treatments to individual patients. Recent advances in stem cell technology, allow researchers to create models of diseases or individual patients for personalized medicine. Although organ-on-chip devices expose these models to a more physiological cellular environment, these devices face significant challenges including assay throughput, signal quality, and scalability of production.
To address these challenges, imec developed a 16k CMOS-based microelectrode array with 16 independent, microfluidic chambers. This platform offers both scalability in fabrication and assay throughput. Further micropatterning of the surface allows for a structured growth that better resembles a specific organ. By combining these devices with patient-specific cell models, these platform shows great potential for cardiac, neuronal, and oncological applications in the field of personalized medicine.

Biography
Dr Thomas Pauwelyn has studied at KU Leuven, Belgium, since 2008. He earned his BSc in Bioscience Engineering specializing in Catalytic Technologies in 2011 and a Master's in Nanoscience and Nanotechnology with the Bioscience Engineering option in 2013. He then received an IWT fellowship to do a PhD at KU Leuven and imec's Life Science Technologies group, which finished in 2018.
Thomas is currently working as a post-doctoral researcher with an Innovation Mandate grant from VLAIO, investigating strategies to valorize the results from his research. Thomas's research focuses on developing novel organ-on-chip systems for predictive toxicology and drug development. He is also investigating how organ-on-chip devices may help stratify patients and help enable personalized medicine.

Sensome: Medical Devices Enhanced by Microelectronics to Revolutionize the Treatment of Stroke

F. Bozsak
CEO and co-founder
Sensome, Massy, France

Abstract
Ischemic stroke is the leading cause of long-term disability in the world affecting over 13 million people each year, costing tens of billions of dollars to society. Today mechanical thrombectomy has been established as an effective treatment for ischemic stroke, revolutionizing the treatment of this devastating disease for about a third of the patients. Physicians now have a variety of interventional medical devices at their disposal allowing to mechanically remove the blood clot blocking the brain artery and causing the stroke. The biological composition of the blood clot significantly influences the mechanical properties of the clot ranging from hard and sticky (white) clots to soft and brittle (red) clots. The mechanical properties of the clot can have a major impact on the retrievability of the clot with the chosen device. Unfortunately, the physician has no tool today to determine the clot type (white or red) upfront and thus know, which device will be the most effective to remove the clot. He/she is thus limited to a trial and error process baring grave risks for the patient.
Sensome has developed micrometric AI-powered impedance sensors that can identify the biological nature of the tissue they touch in real-time. Integration of this proprietary technology into a probe to guide medical devices in arteries (a guidewire), yields our first product, Clotild®, which will recognize the blood clot type during the treatment of ischemic stroke. This information on clot type can then guide their decision to choose the device that will remove the clot the fastest for each patient and consequently would maximize the patient's chances to recover and live a normal life.
Beyond stroke, Sensome has been able to show that our technology could also help transform the current standard of care in oncology.

Biography
Franz obtained a M.S. in Aerospace Engineering from the University of Stuttgart and a Ph.D. from Ecole polytechnique in Biomedical Engineering on the optimization of stents. He is a graduate of the Stanford Ignite/Polytechnique business program. In 2014, he co-founded Sensome and has since brought together a team of renowned scientists, engineers and doctors to realize his vision of connected medical devices. He was named Innovator Under 35 by the MIT Technology Review in 2016.

How Hyperspectral Sensing Technologies can Help Enabling Wearables for Health Diagnostics

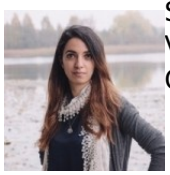
C. Smets
CEO
Spectricity, Mechelen, Belgium

Abstract
The past decade have seen quite some introductions of wearables measuring several health related parameters. Fitness wearables and skin patches measuring Optical Heart Rate are readily available. Significant advances have also been done on integrating Heart Rate Variability and ECG measurements in smart watches.
On the other hand, other important health related parameters can not yet be integrated in a wearable in a reliable way. For example, up to today, there does not exist a wearable yet which can continuously measure Oxygen Saturation with medical grade accuracy at other parts on the body besides on the finger or ear lobe. Similarly, skin hydration measurement is not yet available in a wearable device.

In this presentation we will explain some recent advances in using Hyperspectral Sensing to measure parameters such as oxygen saturation measurement and skin hydration sensing for integration in small wearables. Actual results will be shown how Spectricitys patented CMOS Hyperspectral filter technology based on compact optical sensors with a size of only a few square mm can help to manufacture really compact patch and strap wearables which should be able to measure Oxygen Saturation and Skin hydration with medical grade accuracy.

Biography
Dr Carl Smets has more than 30 years experience in various Engineering and Marketing roles in the Semiconductor industry with special focus on Image processing.
Before joining Spectricity as CEO, Carl was General Manager at KLA, the leading supplier for Inspection and measurement Equipment in the Semiconductor industry. In that position he lead several Divisions ranging from Wafer Inspection over Final Component Inspection and Solar Cell Inspection product lines.
Carl graduated as Master in Physics at the Catholic University of Leuven in Belgium. He also holds a Phd in Image Processing at the same University.

Introducing the Next Generation of Sleep Diagnostics



S. Adnane
VP Product, Co-founder
Onera, Eindhoven, Netherlands

Abstract
The field of sleep medicine is stuck in some fairly dark ages, and not the beneficial kind of darkness that's important to fall asleep.

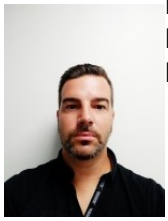
Accurate sleep testing today requires a visit to the sleep clinic, where patients spend hours in unfamiliar rooms with cumbersome sensors attached to their face, scalp, chest and limbs. It's a technology that hasn't changed much in the past thirty years, and the experience is often uncomfortable, inconvenient and expensive.

But while sleep diagnostics are stuck in the past, more and more people are starting to realize the future of health depends on good sleep. One in five people struggle with sleep today. Whether it's insomnia, sleep apnea, narcolepsy or a host of other disorders, days are spent exhausted, rundown, and suffering from an inability to focus or learn. And sleeping disorders can also affect physical and mental well-being. Recent studies have linked poor sleep to many chronic, life-threatening diseases and conditions, including hypertension, type 2 diabetes, obesity, heart disease, and depression.

Now more than ever, sleep needs to be part of the conversation between doctors and their patients, as vital a consideration as cholesterol, blood pressure, cardiac stress tests and screening for cancers.

Biography
Soukaina is a Co-Founder & VP Product at Onera. Originally from Morocco, she left home at age 17 to study in France, ultimately earning a Master's degree in Materials & Technical Textiles from ENSAIT. Her fascination with wearable technology and technical textiles has taken her across the globe, to the Czech Republic, Taiwan and now the Netherlands. Prior to Onera, she was an Entrepreneur in Residence at imec. Now she's dedicating herself to an ambitious mission – to help all sleep sufferers get access to diagnostics and treatment – no matter who they are or where they live.

Enabling Smart MD with Custom Integrated Circuit (ASIC)



R. Girin
Business Development Manager
IC'Alps, Meylan, France

Abstract

In the context of the digitalization of Medical Devices (MD) and of the associated revolution of the Internet of Medical Things (IoMT), there is a growing need for optimized electronic.

Today, the most widely used approach to develop MD products is electronic boards implemented using Components Off-The-Shelf (COTS) or FPGA, with performances, content and form factor as they are. No customization and limited optimization is possible which does not really match the stringent medical application requirements.

We can now demonstrate that ASIC approach shows decisive advantages for medical applications and especially for implanted medical devices.

People may think that custom integrated circuit (ASIC) is a way too expensive for their device. But, thanks to the constant decreasing cost of silicon, the possibility for medium to low volume applications to benefit from an ASIC becomes a reality.

An ASIC is a circuit designed to do exactly what you need and nothing more, with the required level of quality (ISO13485 compliant for medical). Consequently, it facilitates miniaturization through small chip footprint and drastic BoM reduction, it enables extreme low power consumption, a key parameter to optimize the autonomy.

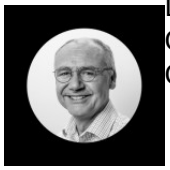
Furthermore, as you own the ASIC, you will have full control of your chip procurement with a low sensitivity to obsolescence, that is useful when product life ranges more than a decade.

Always with the willingness to make easier the life of MD developers, IC'Alps is working on a new Medical Optimized multi-sensor Platform (MOPx). It offers an industrial solution containing various physiological readouts (ECG, PPG, GSR, Bio-Z), power management features to optimize battery life time, security functions to guarantee data integrity, processor for algorithms and wireless communication for remote data collection and control. This MOPx platform will help MD developers to accelerate and secure the way from the POC to the industrialized MD product.

Biography

Graduated in Electrical Engineering in 2004, Remy GIRIN developed his technical, management and business knowledge in the semiconductor market for nearly 15 years. He participated numerous European collaborative projects for bringing disruptive innovations to the market. After having encountered success in helping growing the innovation and turnaround the operations in his previous company, Remy joined IC'Alps just after registration in 2018 a company specialized in ASIC design in particular for medical applications, and is now committed to raise IC'Alps' business.

A Medical Grade T-shirt for Continuous and Predictive Medical Remote Monitoring



L. Vandebrouck
Chief Executive Officer
Chronolife, Paris, France

Abstract
RPM (Remote Patient Monitoring) services will rapidly grow and be adopted for patients with Chronic diseases to improve their Quality of Life, reduce the (re)admissions and reduce the healthcare expenses. To succeed and reach the three latter objectives, RPM services and associated medical devices used for RPM need to combine several characteristics: 1) easy of use and/or comfortable for wearables for adherence; 2) continuous monitoring for a better support for diagnostics and prediction; 3) multi-parametric physiological parameters combined in quasi real-time to predict clinical event and alert in due time.

Chronolife has developed and has started commercializing a solution combining these three elements for success. Chronolife is an healthcare artificial intelligence start-up that develops solutions for remote monitoring and prediction of the health status of a patient. Its patented technology is a unique neuromorphic algorithm called HOTS (Hierarchy Of event-based Time-Surfaces), which analyses several data flows continuously, to characterize clinical events.

Leveraging this patented HOTS technology and algorithm, Chronolife has developed a smart washable T-shirt that integrates various sensors to monitor physiological data continuously. This data is analyzed by the smartphone application on a patient's phone that uses HOTS technology to conduct data fusion. It is capable of detecting changes in a patient's health and triggering alerts to healthcare profesionnals to predict acute pathological episodes.

Biography
Laurent Vandebrouck is Chronolife's Chief Executive Officer and was Managing Director Europe Qualcomm Life before prior to that. He has 25 years of experience in the development, launch and operation of end-to-end services for enterprises among which 8 years in digital health, remote patient monitoring and connected therapies for the Pharma, MedTech and large integrators, service providers and HCPs in Europe and in the US.

K'Watch, World First Painless Continuous Glucose Monitoring Smartwatch

L. Pierart
CEO
PKvitality, Le Kremlin Bicêtre, France

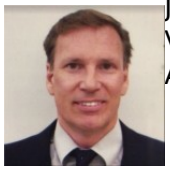
Abstract
PKvitality is an advanced bio-wearable company currently working on K'Watch, a CGM in a form of a smartwatch. It measures the glucose level from the interstitial fluid painlessly. Completely invisible to others, the diabetic patient can check its level discreetly and be alerted by an on-body vibration of hypo or hyperglycemia episodes to come.
Using the same technology, PKvitality is also working on K'Watch Athlete, a smartwatch which will provide real-time monitoring of their lactic acid – an indicator of muscle fatigue – to significantly improve an athlete's training and performance.
We mainly target the diabetic patients taking insulin (est. 100M). Our unique user experience and price structure should enable us to target both diabetics Type 1 and Type 2.

Compared to the Glucose Monitoring devices, K'Watch has the following advantages:
- **Convenient**
- **Painless**
- **Irritation-free**
- **Discreet and safe**
- **Affordable**

The system measures glucose levels by analysing interstitial fluid (ISF), painlessly, blood-free, and with high accuracy. This is possible thanks to SkinTaste®, a patented biosensor array that uses micro points (<1mm long) in order to analyse chemical compositions of the interstitial fluid. Near real-time information about glucose levels that, correlated with physical activity, diet, and insulin dose, enables better blood glucose control in patients with diabetes. The watch also integrates activity and heart rate measurement to better help diabetics to understand their condition.

Biography
Luc Pierart, CEO
25 years of experience in design and development of technological devices in reknown companies such as Motorola, TCL, Alcatel and Lacie. He has led teams of up to 50 people in different countries such as France, China, Italy or the US.

Non-Invasive Continuous Glucose Monitor (NICGM) for Diabetics



J. Hubert
VP of Engineering for Alertgy
Alertgy, Melboune, United States

Abstract
Alertgy is developing the first noninvasive continuous glucose monitor (NICGM) wristband. The monitor consists of a wristband, App and IoT solution. Using its proprietary technology, Alertgy's Freedom detects blood glucose levels without any invasive needles or sensors, and alerts the patient and family, friends and caregivers via its smartphone link and automated alarm capability. These features provide accurate routine blood glucose measurements without the customary needle prick and meter device or implanted sensor needles and provide potentially lifesaving alerts when glucose levels are dangerously high or low. Historical data can be reviewed by the patient or shared with healthcare professionals.

Biography
John Hubert, VP Engineering of Alertgy has designed over 200 Monolithic Microwave Integrated Circuits helping to provide a paradigm shift that significantly reduced the size of military and commercial products. Lockheed Martin awarded him the coveted "APEX" award after his team successfully developed a MMIC based High-Power Quasi-Optic Microwave Amplifier for DARPA. John also participated in spinning out a startup commercial company from Lockheed Martin, producing MMIC based transceivers and radiometers. Throughout his career, he has co-authored several papers, patents as well as a textbook. John earned an accelerated MS degree in Electrical and Computer Engineering from UMass through an industry sponsored program.