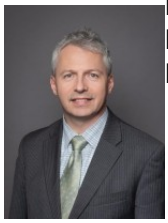
SMART MedTech

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.

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.

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.

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.

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

MedTech Europe
from diagnosis to cure

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.

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.

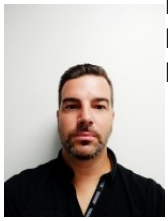
Microfluidic, CMOS Microelectrode Array-based Organ-on-chip System: a Platform for Personalized Medicine

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.

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.

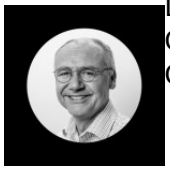
Furthermore, as you own the ASIC, you will have full control of your chip procurement with a low sensitivity to obsolescence, that is useful when product life ranges more than a decade.

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.