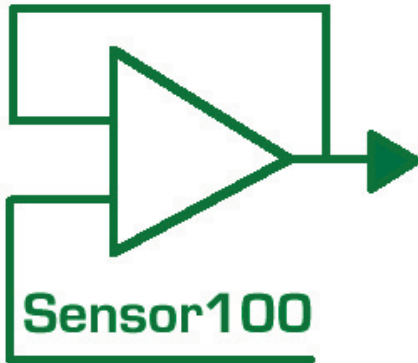


May 2016

Sensor100

The International Bio-sensor and Chemo-sensor Network

Linking academic, clinical and
commercial worlds



**News and views from the
Sensor100 community**

**Edited by:
Michael Brand PhD SM
FRSC**

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See **Sensor100** on social media



Sensor100



Sensor100 Group



@Sensor100AgTech



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From the Editor

I often seem to use this space to unburden myself of all those niggling problems that beset all of us from time to time. However, we set a record this month for a week in which too many things went wrong all at once. Without giving you the full list: our in house telephone system broke (BT replaced hardware at the exchange- remarkably quickly); the venue for our SIFAA 2016 conference decided to cancel us (no, we don't either, but it is sorted now); next door's house caught fire (Fire Brigade sorted it in 20 minutes); Suzanne vacuumed up her wedding ring (found stuck inside the machine); and so on...

We entered the Virgin Voom 2016 competition with The Cancer Challenge. Many thanks to those of you who voted for us; we didn't make the top 80, but we gained a lot of publicity and made some valuable contacts, which will progress the project. We're now on the first page if you Google Biosensors for Cancer, which has to be worth a lot. Slightly worrying is why more of you didn't vote for us - our network is several thousand and yet we only received a few hundred votes. Not sure what that is/was about.

Sensor100 is a-political so won't comment on the heated elections on both sides of the Atlantic. There was a cartoon which had the headline "Warning - may induce sleep" which I thought was only too true.

Finally, it was a long weekend on both sides of the Pond. My hectic weekend is depicted below - I hope you enjoyed yours too.

Kind regards

Michael

michael@sensor100.com



The SPHERE House Can Monitor Its Residents' Health

Wearable sensors linked to smart phones are currently a leading product in the consumer technology market. This technology has now moved far passed simple monitoring of heart rate, which was state of the art in the 1980s, to measuring movement, sleep patterns, even emotions. Efforts are being made to include biochemical parameters like lactate and glucose; as reported in **Sensor100's February** issue, Profusa now has an implantable sensor which is stable for two years.

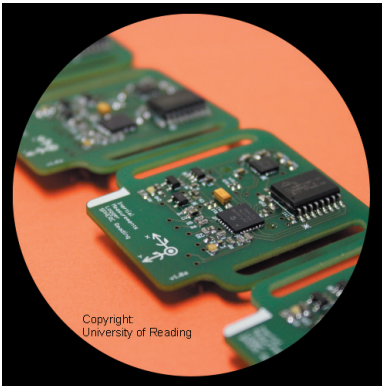
Possibly the world has too many wearable sensor start-up companies, a problem which time and investors will resolve. Fitbit, for example is now subject to a class action suit for reporting erroneous results. Aside from accuracy issues, most wearable sensor developers are very much aware of the Big Brother factor - to what extent are people reluctant to have their every move monitored? Counting your steps each day, how much you sleep, even how many calories you consume daily - are these things which the average, as opposed to fanatical, person wants to know all the time?

Now a research team lead by the University of Bristol, UK, has equipped an old Victorian house with an integrated system of 60 sensors, cameras, and occupant wearables. The plan is for up to 100 such homes to be wired by 2018. Occupants of the houses will be subject to Big Brother scrutiny 24 hours a day, but with the option of disabling information they prefer to keep private.



Photo: Sion Hannuna

The Sphere House continued...



SPHERE - a Sensor Platform for HEalthcare in a Residential Environment - is a £15 million project with major funding by the Engineering and Physical Science Research Council. The project is a joint effort by the Universities of Bristol, Reading and Southampton, in collaboration with IBM, Toshiba, Bristol City Council, and the National Institute of Health Research. The project runs until 2018.

The premise of the project is that by monitoring a plethora of indices - air temperature and quality, how often taps are turned on, use of TV and major appliances and many others - information on the occupants' health can be derived by data mining,

“This system, which is invisibly embedded in the house, monitors changes that might be correlated with certain health conditions,” explains University of Bristol Professor Ian Craddock, who is leading the research team. “Many long-term health conditions are highly correlated to lifestyle,” Craddock says. “For example, if someone is sleeping more than they used to, eating less, and slouching, it may be a sign they are developing depression.” Or presumably the result of many other lifestyle/behavioural factors?



*Prof. Ian Craddock
University of Bristol
Faculty of Engineering*

The intention of SPHERE is not to develop sensor technology specifically for individual disease conditions but rather to impact a range of healthcare needs simultaneously by employing data-fusion and pattern-recognition from a common platform of largely non-medical/environmental networked sensors in a home environment.

The Sphere House Continued...

The project appears to be significantly different from other home health monitoring projects which tend to focus on long term chronic health conditions such as COPD, diabetes, and heart failure. The intention of these projects is to monitor patients in the home, and provide data to the patients themselves and their healthcare providers. A study by the Scripps Translational Science Institute ([Healthcare It News](#)) has found no short-term benefit in health costs or outcomes for patients who monitored their health with connected devices. “It was a bit disappointing, but remember, this was the first multisensor trial that’s ever been reported, so in that respect it was a pioneering effort,” study author and STSI Director Dr. Eric Topol said. “And you know, it was very difficult because we had these three different sensors, glucose, blood pressure, and heart rhythm, and a lot of patients had all three problems or two of them, and had to have a dashboard created. There are a lot of logistical challenges there.”

In contrast, the Sphere Project seems to be designed to collect and rationalise behavioral data, with the intention of helping the medical community better understand how certain conditions progress over time. The challenge would seem to be in developing algorithms which allow relevant information to be mined. Behavioral changes which indicate progression of degenerative diseases happen slowly over periods of years. Whether it is advantageous to monitor behavior for years vs. more direct diagnosis via biosensors remains to be seen.

Read more...

The Sphere Project

IEEE newsletter [the institute](#) “The SPHERE House Can Monitor Its Residents’ Health”



INNOVATION IN ENVIRON

21 - 22 September 2016
Ron Cooke Hub, University of York

Program

- Plenary Session:** How and Why of Environmental Monitoring
Technical Sessions: Pollution Assessment in the Urban Environment
Sensors for Water Monitoring
Air Monitoring for Health

Invited and Submitted Papers | Poster Competition
Exhibits | Book of Abstracts | Networking Reception

Call for Papers and early **Registration** now open

Abstract Deadline: 15 July

Full Program and Registration details at:

www.sensor100.com/IEM2016



Program	Call for Papers	Registration	Venue
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Confirmed Speakers



Prof. Dermot
Diamond



Dr. Werner Brack



Dr. Francesco Pilla



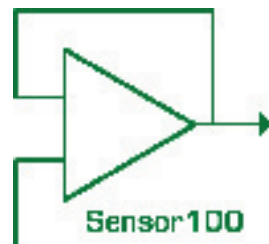
Prof. John Atkinson



Prof. Gerald Thouand



Organised by



Sensors in Medicine 2016

Linking academic clinical and commercial worlds

9 -10 November 2016
Double Tree Docklands London

The 4th Annual Sensors in Medicine Conference will comprise:

- ▶ Invited and contributed papers
- ▶ Poster competition with cash awards
- ▶ Exhibits of sensor technology
- ▶ Panel discussions
- ▶ Networking reception

Papers and Posters are invited on the Conference topics:

Implantable and wearable sensors
Sensors and PoC for infectious disease diagnosis
Sensors for diabetes management
Advanced sensor technology for healthcare

Abstract submission deadline: 29 July

Abstract Submission instructions & Registration of Interest

www.sensor100.com/SIM16





Sensors in Food and Agriculture

29 - 30 November 2016
Møller Centre, Cambridge UK

**The Conference will explore current applications and
future opportunities for sensor technology in
Food and Agriculture**



Keynote Speaker
Stephen Whalley
Chief Strategy Officer
MEMS & Sensors Industry
Group

Program Topics

Remote sensing | The Internet of Things | Data Analysis
Sensors in Food Production
Detection of Contaminants and Pathogens
Food Quality from Farm to Table
Animal, Bird and Fish Welfare
Sensors in Plant Crop Production | Hydroponics
New Sensor Technology for Agriculture

Call for Papers Now Open

Deadline: 16 September

Register Interest and Abstract Guidelines

www.sensors100.com/SIFAA16

The Cancer Challenge



The earlier cancer is diagnosed, the greater the chances of a cure. So why is only 20% of cancer research funds spent on finding better ways to detect the disease earlier?

The Cancer Challenge is to address that problem face on: Identify better diagnostic tools and convince the healthcare industry to adopt them. Our Objective is to:

- Build a network of biomarker, sensor and oncology experts
- Identify and rank cancer diagnostic tools using an on-line innovation platform
- Organise conferences to promote new diagnostic technology
- Promote earlier stage diagnostic tools to clinicians

Biosensors for Cancer Diagnosis

20th July, London

A one-day workshop exploring opportunities

By invitation only

Contact michael@sensor100.com if you would like to attend

Join The Cancer Challenge Network

*"...thanks for taking on the cancer project. To beat that evil thing we are going to need all the folks like you we can get. Those of us who are "survivors" are very appreciative. May you never be touched by the Big C.
Warm regards, Don G."*



ESEAC MMXVI

16TH INTERNATIONAL CONFERENCE ON ELECTROANALYSIS
12TH -16TH JUNE 2016
THE ASSEMBLY ROOMS, BATH, UK



Chemistry Means Business 2016

15 - 16 June 2016, London, UK



8th Annual Conference: Sensors 2016

21 June 2016



THE KNOWLEDGE FOUNDATION'S SECOND ANNUAL

BIODEFENSE WORLD SUMMIT 2016

June 27-30, 2016 | Baltimore, MD

RSC Faraday Discussion

Single Entity Electrochemistry

31 August - 2 September 2016, York UK

Topics include: nanoparticles, nanotubes and nanowires; nanopores; complex surfaces and reactions at the nanoscale; molecular electroanalysis from single molecules to single cells.



IEEE SENSORS 2016

Orlando, Florida | OCT 30 - NOV 2, 2016





**ASSOCIATION OF
APPLIED BIOLOGISTS**
President: Professor Bill Davies



**BRITISH SOCIETY FOR
PLANT PATHOLOGY**
President: Dr Julie Flood

A two day conference
at University of Nottingham,
Sutton Bonington Campus,
Leicestershire, UK
on 27-28 June 2016

CALL FOR PAPERS NOW CLOSED

**Exploiting novel sensors for
detecting abiotic and biotic stress
in crops**

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Tel: +44 (0)2476 575195; Fax: +44 (0)1789 470234 Email: John@aab.org.uk

www.aab.org.uk

Bayer offers \$62 billion for Monsanto to create biggest agriculture supplier

German crop chemical group Bayer has made an offer of \$62bn (£43bn) for seed company Monsanto in a deal that would create the world's biggest agricultural supplier. The unsolicited proposal, which includes debt, would be the largest foreign takeover by a German company if accepted.

Reported by **Farming UK** 24 May

Smartphone-connected allergen device startup 6SensorLabs raises \$9.2M, changes name to Nima



Nima's first product, which has been available for preorder since October 2015, is a gluten sensor. Users take a small sample of their food, put it in a small capsule that Nima provides, and put the capsule into the device. From there, the device will show a sad face if the food sample has 20 parts per million or more of gluten and a smiley face if it doesn't. In addition to testing food and returning a result, the sensor will send the data to the user's smartphone via Bluetooth and allow the user

to record and store the results of each meal. Nima will use the funds to release food sensors for peanut and milk products. These offerings are expected to launch in 2017. Currently Nima's gluten sensor is still in beta testing but the company plans to ship it to consumers later this year.

Reported by **MobileHealthNews** May 19

Ocean Optics Takes a Spectral Bite Out of Strawberries



Strawberries are a healthy food, with lots of vitamin C and fiber packed in a small, convenient package. To find out what spectroscopy can reveal about strawberries, Ocean Optics measured sugars, acidity, vitamin C and firmness in various samples. The results may surprise you.

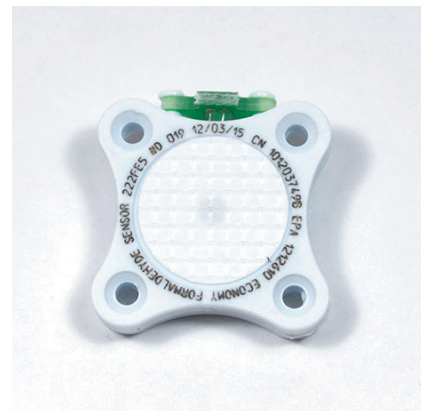
So what did the study really tell us to help in choosing better berries? Though the deeper red berries may look more “ripe”, hinting are better nutrition and taste, it is not necessarily the case. Firmer berries have more vitamin C, even though their higher acidity delivers extra “bite”.

[Read the full report...](#)

Dart Sensors announces a detector for food freshness

Dart Sensors will roll out a series of new electrochemical sensor products in the coming months, many based on our world-leading alcohol sensor technology.

The FoodFresh sensor provides a comprehensive solution to the detection of incipient food spoilage, being highly sensitive to gaseous decay products of fruit, vegetables, milk and milk products, fish and meat. Fruit and vegetable sugars ferment to form ethanol, to which the sensor is highly sensitive. Fruits such as bananas release ethylene during ripening: the sensor first catalytically converts ethylene to ethanol. Milk souring produces lactic acid: the lactic acid molecule contains an alcoholic O-H group. The FoodFresh sensor is also sensitive to primary amines such as putrescine and cadaverine, which are reaction products of the spoilage of meat and fish. Reported on LinkedIn.





ing.world 1Q 2016

What makes a smart city intelligent?

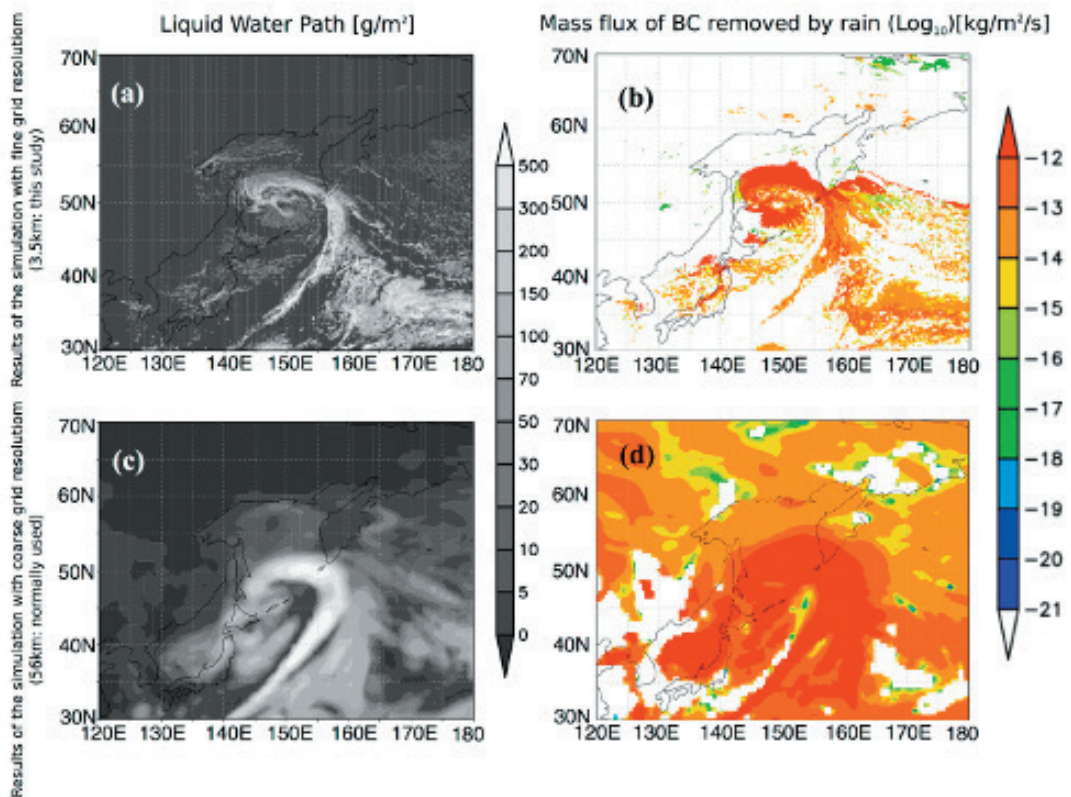
The city of the future already exists. It's called Songdo, or Songdo International Business District in full, and is situated 65 kilometres to the south-west of the South Korean capital city Seoul. Boasting a population of some 90,000, this futuristic city proudly claims to be the 'world's smartest city'. The inhabitants of Songdo, for instance, never have to place a rubbish bag outside on the street. All homes and offices are connected to a vast network of underground tubes which suck in the waste and transport it to processing centres for sorting and recycling. The city is also packed full of sensors and cameras which continuously monitor traffic movements, air quality, energy consumption and other human activities.

According to Gerhard Schmitt, professor in Information Architecture at the Swiss university of ETH Zürich and director of the ETH Future Cities Laboratory, cities like Songdo that are built from scratch (greenfield developments) with technology companies driving the agenda are no longer the way forward. "Businesses came up with solutions to problems that hadn't even been defined yet. The result is cities that are high-tech, but not smart," says the Swiss professor. "There is also an alternative approach to smart cities that is increasingly gaining ground. The first step involves trying to identify the problems that the inhabitants really face in their daily lives. We do this using big data wherever possible – for instance, by gathering information on such issues as traffic flows, crime and air pollution, and then looking to see what technological solutions are available."

Full report at [Ing.world](#) IQ 2016

Current atmospheric models underestimate the dirtiness of Arctic air

Black carbon aerosols—particles of carbon that rise into the atmosphere when biomass, agricultural waste, and fossil fuels are burned in an incomplete way—are important for understanding climate change, as they absorb sunlight, leading to higher atmospheric temperatures, and can also coat Arctic snow with a darker layer, reducing its reflectivity and leading to increased melting. Unfortunately, current simulation models, which combine global climate models with aerosol transport models, consistently underestimate the amount of these aerosols in the Arctic compared to actual measurements during the spring and winter seasons, making it difficult to accurately assess the impact of these substances on the climate.



Global aerosol transport simulation using the K computer

Riken Press Release May 25

NIH Seeks Grant Applications on Cancer Exosome Biomarker Research

The National Institutes of Health announced that it is seeking grant applications for projects investigating the potential of exosomes and extracellular vesicles (EVs), as well as their cargo, as biomarkers for cancer risk assessment, detection, diagnosis, and prognosis.

Cancer cells are known to release more exosomes than normal cells, and data indicate that tumor-secreted exosomes can promote tumor progression, survival, invasion, and angiogenesis. As such, the analysis of exosomes isolated from the blood or other body fluids of cancer patients could provide insight on cancer cell biology and serve as non-invasive predictive biomarkers for early detection, progression, and metastasis, the NIH said. Earliest Submission Date: 13 September 2016.

Reported by [GenomeWeb](#) 26 May

Pioneers Festival Recognizes HealthTech Start-ups

The Pioneers Festival, held in Vienna on May 24-25 is the major event for future technologies and entrepreneurship. 500 technology start-ups showcased their technology to almost 2000 corporate partners and investors. The Festival ranks the company's presenting to the top 7 and the top 70.

Among the top 70 in 2016 were:

X.Glu - the world's first battery-less glucose meter

ambiotex - a wearable shirt to monitor heart-rate, stress

Sentio Solutions - Feel, a wristband that tracks human emotions

See the complete [Top 70 list](#)

OffTopic but Worth a Look

A Sloan School classmate, who voted for The Cancer Challenge, has made a career out of art rather than the kind of things MIT expected of us. Liz Maruska paints stunning scenes from her home State of California - see an example below:



Love Notes from the Coast in Blue

Liz Maruska (Liz@lizmaruska.com)

Maruska Arts

412 Mitchell Dr

Los Osos, CA 93402

See www.lizmaruska.com for catalogue of paintings

Mouthguard biosensor with telemetry system for monitoring saliva glucose

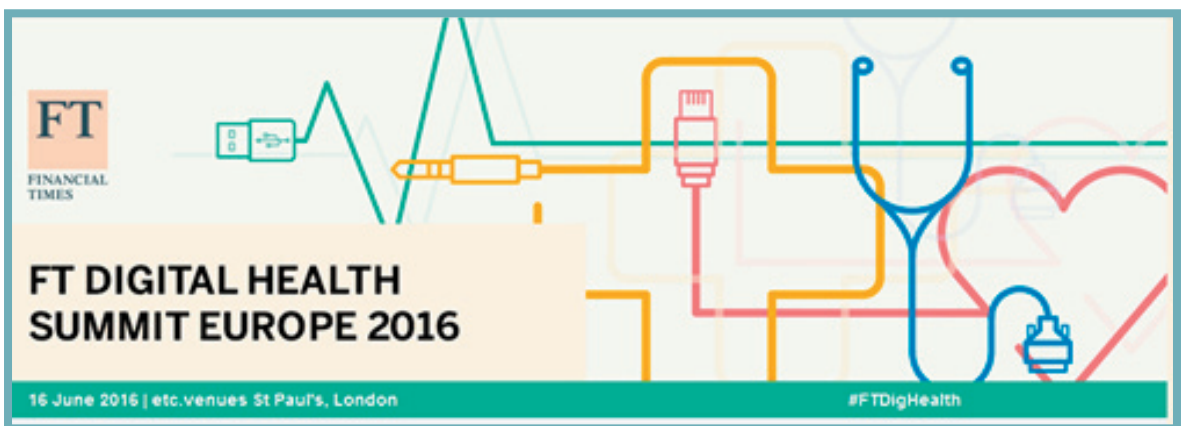


Kohji Mitsubayashi at Department of Biomedical Devices and Instrumentation, Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental University, and co-workers have developed a detachable “Cavitas sensor” to apply to the human oral cavity for non-invasive monitoring of saliva glucose. In artificial saliva composed of salts and proteins, the glucose sensor is capable of highly sensitive detection over a range of 5–1000 $\mu\text{mol/L}$ of glucose, which encompasses the range of glucose concentrations found in

human saliva. It is suggested the sensor will be useful for management of dental patients. The an update of this work will be reportetd at Biosensors 2016 in Gothenberg. Reported in [Biosensors and Bioelectronics](#) 84(2016)106–111

Review of Cavitas Sensors: Contact Lens Type Sensors & Mouthguard Sensors

Kohji Mitsubayashi and Takahiro Arakawa
[Wiley On-line Library](#) 12 May 2016



Engineers take first step toward flexible, wearable, tricorder-like device

Engineers at the University of California San Diego have developed the first flexible wearable device capable of monitoring both biochemical and electric signals in the human body. The Chem-Phys patch records electrocardiogram (EKG) heart signals and tracks levels of lactate, a biochemical that is a marker of physical effort, in real time. The device can be worn on the chest and communicates wirelessly with a smartphone, smart watch or laptop. It could have a wide range of applications, from athletes monitoring their workouts to physicians monitoring patients with heart disease.



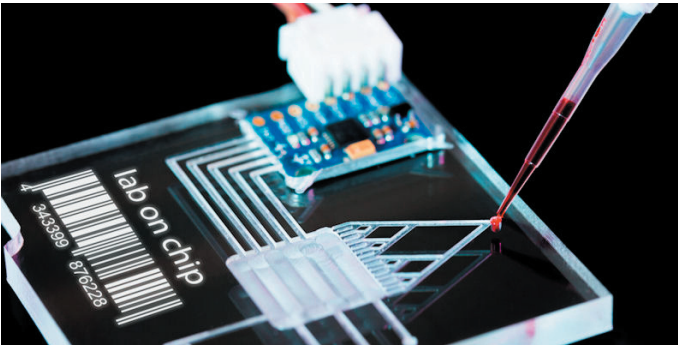
Study co-author Amay Bandodkar demonstrates how the ChemPhys patch works while riding a stationary bike.

Nanoengineers and electrical engineers at the UC San Diego Center for Wearable Sensors worked together to build the device, which includes a flexible suite of sensors and a small electronic board. The device also can transmit the data from biochemical and electrical signals via Bluetooth.

UC San Diego [Jacobs School of Engineering](#), 23 May



University of Leeds awarded £3.8m to tackle antibiotic resistance



The project at the University of Leeds brings together twelve researchers from the faculties of Engineering, Biological Sciences and Medicine and Health. This highly interdisciplinary team will develop a new tool that can be used by doctors to detect the presence of a bacterial or viral infection quickly before antibiot-

ics are prescribed. The test will be able to identify which bacterial strain has caused the infection, as different strains require different treatments, and whether the particular type is commonly resistant to antibiotics.

University of Leeds [School of Electronic and Electrical Engineering](#) 19 May

NIAAA selects winners of its Wearable Alcohol Biosensor Challenge

The National Institute on Alcohol Abuse and Alcoholism announced the winners of its Wearable Alcohol Biosensor Challenge, a competition to design a discreet device capable of measuring blood alcohol levels in near real-time. The winning prototype and recipient of the \$200,000 first prize was submitted by BACtrack, a company known nationally for designing and selling portable breath alcohol testers for consumer use and professional use. Their entry, the BACtrack Skyn, is worn on the wrist and offers continuous and non-invasive monitoring of a user's BAC. Alcohol is detected using a fuel cell technology similar to that in devices used by law enforcement for roadside alcohol testing. The device connects via Bluetooth to a smartphone to store data. NIH [News Release](#) 19 May



Siemens Healthineers – The new brand for Siemens' healthcare business



May 4th - For reasons best known to itself, Siemens announced that it is rebranding its highly respected Healthcare name as “Healthineers”. In the [Press Release](#) Siemens noted “The new brand underlines Siemens Healthcare’s pioneering spirit and its engineering expertise in the healthcare industry. It is unique and bold and best describes the Healthcare organization and its people – the people accompanying, serving and inspiring customers – the people behind outstanding products and solutions.”

Reaction to date has been mixed, a mild understatement. Writing for the [FT.com/Management](#), Lucy Kellaway noted “There is not a single example of a business putting its values to music without mass humiliation” and the chorus line of the new company song suggests that might be true: “We are, we are, we are Healthineers.” Social media reaction to the name change have included the comment: “This is how you destroy a company”.

In another development, Siemens announced Siemens Healthineers has expanded its diagnostics portfolio with the acquisition of NEO New Oncology AG, Cologne, Germany. The acquisition of NEO New Oncology provides Siemens Healthineers an entry point into NGS-based genomic testing and expands its capabilities in precision medicine and companion diagnostics.

Siemens [Press Release](#) May 17

New approach to sorting cells

Microfluidic device distinguishes cells based on how they respond to acoustic vibrations.



A team of MIT researchers has now developed a new way to sort cells, based on their acoustic properties — that is, how they are affected by sound waves, which depends on how dense and compressible the cells are. The new device consists of a microfluidic channel that vibrates at a very low frequency. As cells flow through the channel, they are pushed to a certain position depending on how they interact with the acoustic forces generated by the vibration.

Using this approach, the researchers found that they could distinguish three different types of white blood cells — monocytes, lymphocytes, and neutrophils — even though monocytes and neutrophils are very similar in size. In addition to analyzing red and white blood cells, this technology could also be used for isolating tumor cells from a patient's blood sample, perhaps to monitor the progression of cancer. The researchers also showed in this study that they can distinguish different types of tumor cells based on their acoustic properties.

MIT News May 16

The Theranos Story Continues

Blood-testing firm Theranos has voided two years' worth of results obtained using its Edison platform and has sent tens of thousands of corrected reports to doctors and patients, the Wall Street Journal reports.

COO Sunny Balwani has resigned from the company.

Reported by [GenomeWeb](#) 19 May



Amsterdam, 13 – 14 December 2016

The international MicroNanoConference has an established track record in bringing together the value chain of the different micro and nano fields of endeavour:

Microfluidics, Photonics & Nanoinstrumentation

Full Conference details, Program and Registration

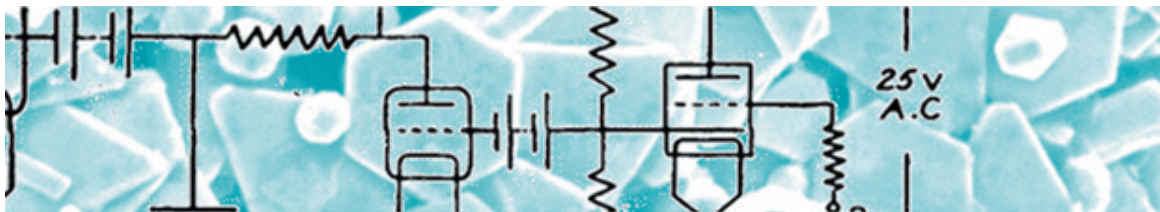
<http://www.micronanoconference.org/>

sensors
expo & conference

June 21-23, 2016


Exhibition Dates: June 22-23

NEW LOCATION: McEnery Convention Center | San Jose, CA



n 2016

Electrochem 2016

 Important: Abstract submission is still open

Stamford Court, University of Leicester

17-19 August 2016

Electrochemical Sensing Symposium

- Biomedical Sensing
- Environmental Monitoring
- Novel Sensing Technologies and Platforms
- Industrial Measurements

To celebrate the 75th anniversary of the submission of Hickling's seminal publication outlining control of potential at a working electrode, regarded as the invention of the potentiostat, the 21st annual Electrochem meeting will be held at the location of its discovery, the University of Leicester, in August 2016.

STUDIES IN ELECTRODE POLARISATION. PART IV.—THE AUTOMATIC CONTROL OF THE POTENTIAL OF A WORKING ELECTRODE.

By A. HICKLING.

Received 16th September, 1941.

Although the electrode potential is considered to be the dominating factor governing many electrolytic processes, it is one of the variables least amenable to direct experimental control. In general it can only be indirectly changed or maintained during electrolysis by alteration of such factors as current density, temperature, electrode material and electrolyte composition. A device whereby the potential of a working electrode can be fixed at any desired arbitrary value would seem, therefore, to have many valuable applications in the exploration of electrolytic processes, and the present paper describes an electrical circuit by means of which this aim can be achieved.

Electrochem 2016

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