Sensors in Medicine 2017

Post-Conference Summary

A **Sensor100** Conference
3 - 5 October 2017

The 5th Annual Sensors in Medicine Conference was held on 3-5 October 2017.

The Sensors in Medicine Conference series uniquely brings together leading academics, clinicians and medical technology companies to review progress and future opportunities for the application of sensor technology in medicine and healthcare.

This short presentation gives an overview of SiM17 for those who were unable to join us this year.

My thanks to all the speakers and support staff who made this conference another success

Michael Brand PhD SM FRSC
Conference Chair

Welcome

Despite a worldwide research effort in sensor development, relatively little of this technology ever reaches the market place and clinic. The overall objective of Sensors in Medicine 2017 is to facilitate the adoption of new sensor technology:

■	Promote innovative new commercial sensor technology
■	Highlight leading academic research near to commercial use
■	Provide a platform to showcase emerging sensor companies
■	Explore trends in healthcare applications of sensor technology
■	Facilitate formation of partnerships for investment and technology transfer

Our Vision

Sensors in Medicine 2017

Sensors in Medicine Archive
2016
2015
2014
2013

- Tuesday 3rd October
  - **Glucose Sensing and Diabetic Care**
- Wednesday 4th October
  - **Sensors for Infectious Diseases; Point-of-Care**
- Thursday 5th October
  - **Sensors for Cancer Diagnosis**

SiM Panel Discussion

Program

Tuesday October 3rd
Glucose sensing and diabetic care

- Glucose sensing for diabetic care, introduced in the 1980's, is the leading commercial application of biosensors, projected to exceed $12 billion by 2020
- Research continues to improve diabetic care:
  - Sensors for sweat, saliva, tears – avoiding painful finer sticks
  - Continuous glucose monitoring using wearable sensors
  - Closed loop insulin pump systems
  - Implantable sensors with long lifetimes

Glucose Sensing and Diabetic Care

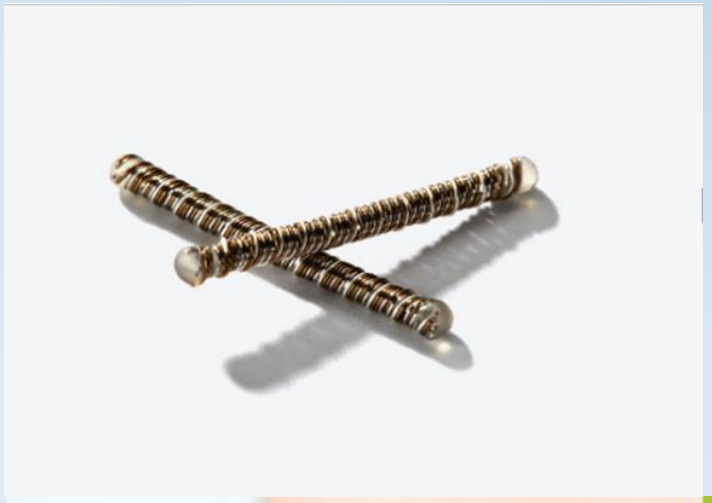
Imperial College London

From trolley to hand held instrumentation

2014 2016 2017

Prof Tony Cass
Imperial College

Sensors in diabetes – where are we now and where are we going?



The NovioSense Approach

At NovioSense we believe that glucose monitoring can be painless and unobtrusive.

Dovile Vegelyte
Noviosense

NovioSense tear glucose sensor

The Eversense System

Sensor

Smart Transmitter

Mobile App

the only CGM:

- *fully implantable sensor*
- *sensor that lasts up to 90 days*
- *on-body vibe alerts*
- *transmitter you can take off and on*

Senseonics

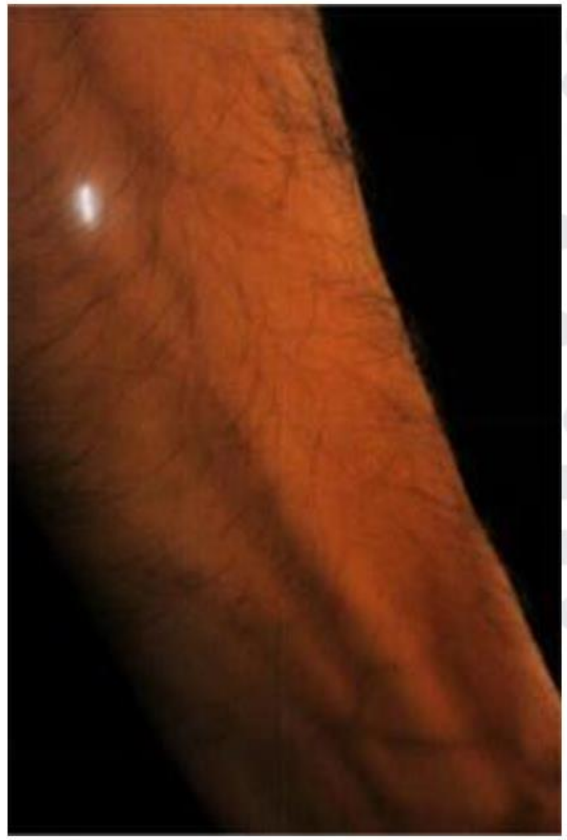
Dr Lynne Kelley
Senseonics

A novel continuous glucose monitoring technology with a long-term and accurate implantable sensor

INTRODUCING THE PROFUSA SENSOR

- Micro hydrogel sensor – 500 micron diameter; 5 mm length
- Soft, flexible, tissue-like properties
- Fluorescence sensing chemistry
- Hypodermic needle placement
- Non-invasive optical signal
- Clinical-grade data
- > 4 year longevity in humans

profusa

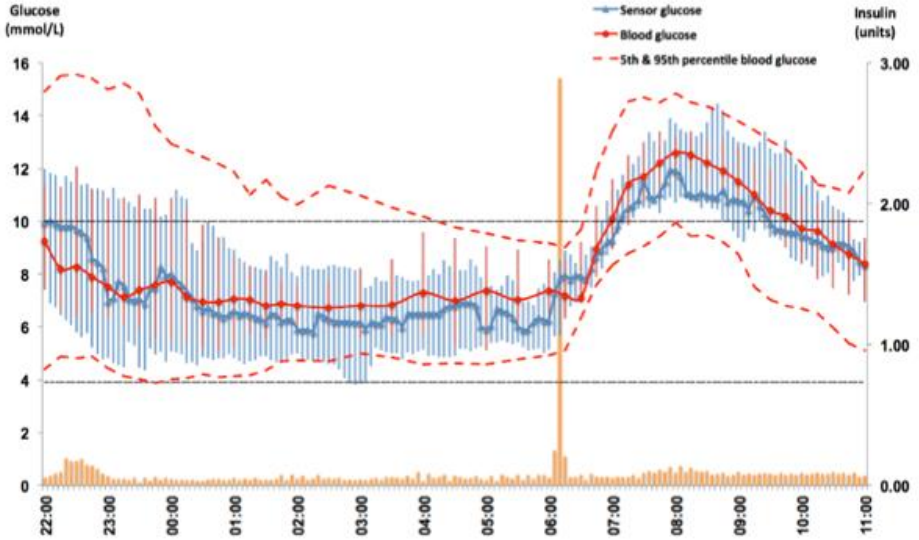


Dr Ben Hwang
Profusa Inc

Continuous glucose monitoring for everyone – what are the barriers and solutions for broad adoption of this key technology?

Imperial College London

Results of Overnight Trials in 20 humans

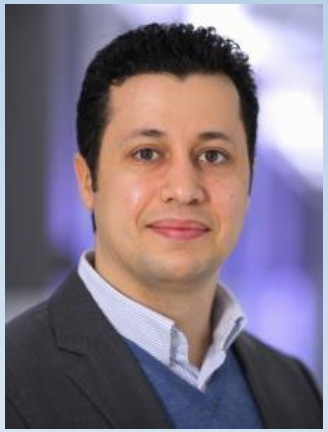


- Mean glucose over 250 hours of closed loop control 7.6mmol/L
- Mean overnight glucose 7.4mmol/L
- No hypoglycaemia

Reddy M,. **Feasibility study of a bio-inspired artificial pancreas in adults with type 1 diabetes.** Diabetes Technology and Therapeutics, 16(9), 2014.

Centre for Bio-inspired Technology

Dr. Pantelis Georgiou



Dr Pantelis Georgiou
Imperial College

The bio – inspired artificial pancreas for treatment of diabetes in the home

Dr Stefania Guerra
Dexcom

Continuous Glucose Monitoring: why, how and for whom?

Wednesday October 4th
Infectious Disease Sensing and Point-of-Care

- In Vitro Diagnostics market for infectious diseases is forecast to reach $26 billion by 2020
- Sensor developments for IDs are driven by:
  - Need for rapid Point-of-Care diagnosis
  - Antimicrobial resistance
  - Rapidly emerging ID outbreaks, e.g. Ebola & Zilka viruses
  - Sensors for resource limited environments

Infectious Disease Sensing and Point-of-Care

What POCTs would GPs consider Useful?

current or potential use of POCT (>50%)

Test	I would use (%)
D-dimer	73
Haemoglobin	72
Troponin	69
BNP	66
Chlamydia	65
CRP	61
Potassium (NB sodium 51%)	61
HbA1c	61
White cell count	60
ESR	58
Gonorrhoea	58
Nose/throat swab for influenza	55
Creatinine	53
Throat swab for Group A Streptococci	53
TSH	53
Quantitative Beta HCG	53
Platelet count	51
Uric Acid	50

Turner et al 2016

Prof Christopher Price
University of Oxford

Point-of-Care Testing: the key models of care

Antimicrobial dosing is a dynamic process

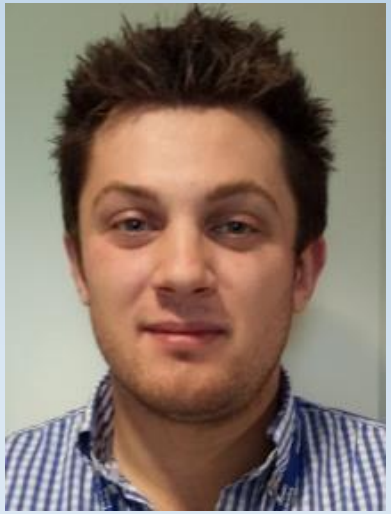
NHS National Institute for Health Research

Inter-individual variability

- Age
- Race
- Ethnicity
- Gender
- Comorbidities
- Medications

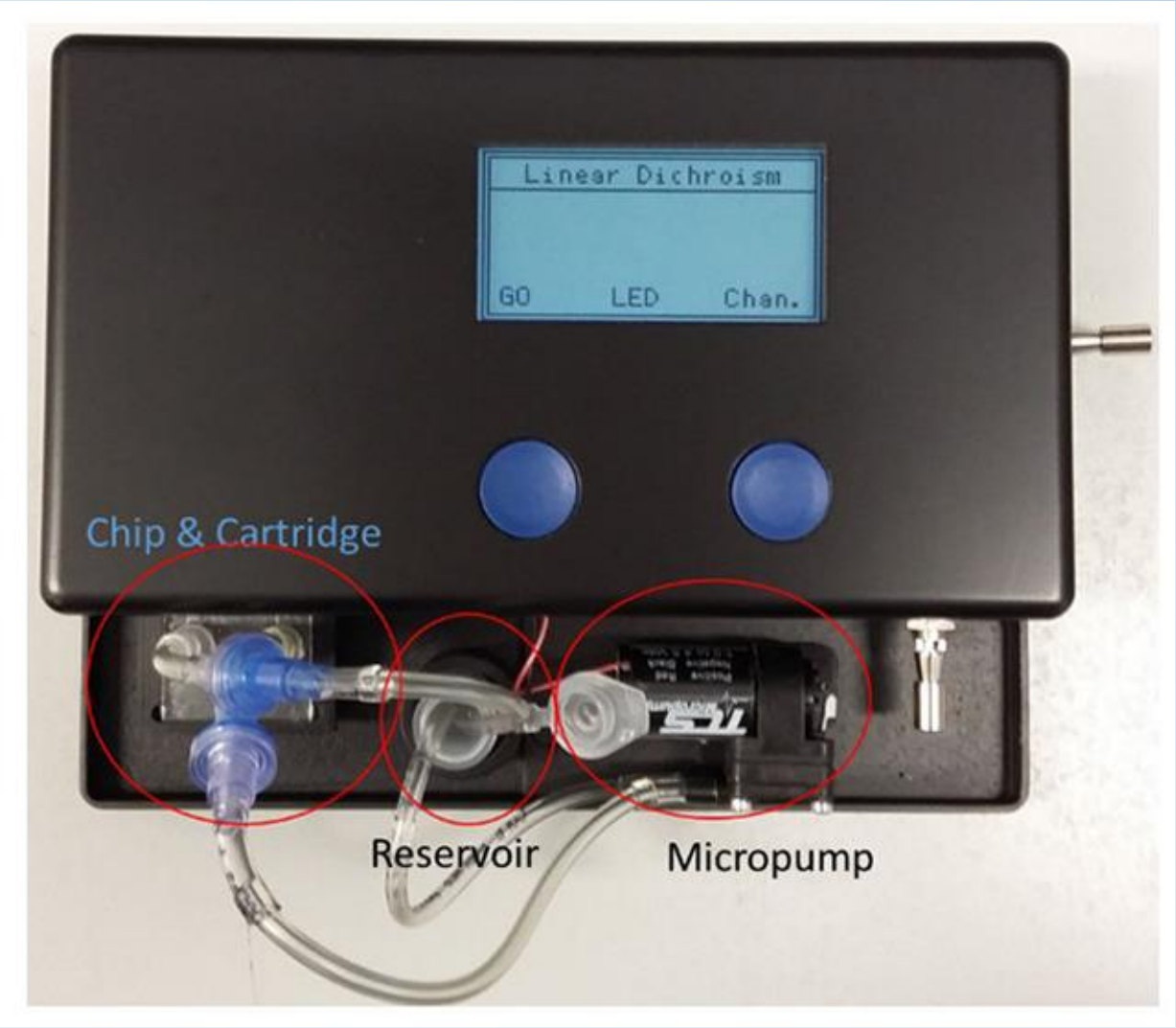
Intra-individual variability

- Hyper-dynamic circulation
- Altered fluid balance
- Renal dysfunction
- Hepatic dysfunction
- Augmented renal clearance
- Organ support



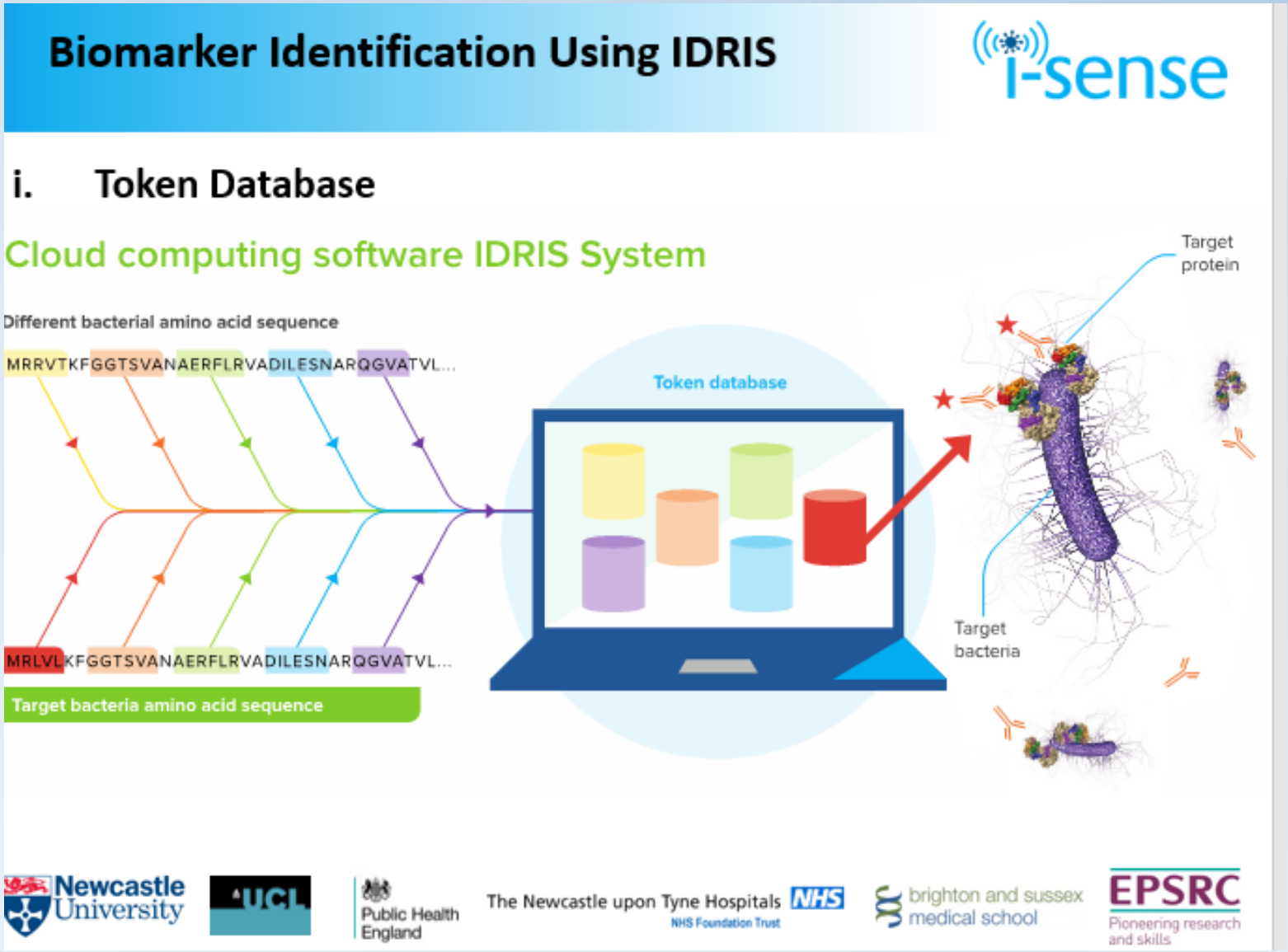
Dr Timothy Rawson
Imperial College

Personalised antimicrobial dosing: Towards a minimally invasive device for antibiotic monitoring in humans



Dr Matt Hicks
Linear Diagnostics Ltd

Linear dichroism for multiplexed infection diagnosis



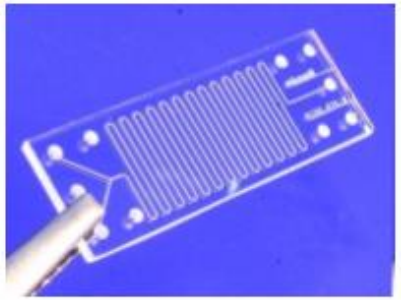
Dr Chris Johnson
University of Newcastle

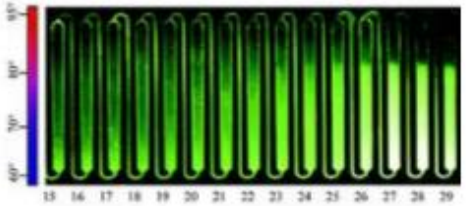
Species specific recognition of bacterial pathogens using targeted antibody design

New acoustofluidics

Microfluidics currently

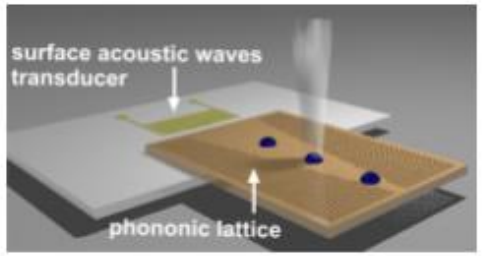
Flow,
with functions defined in
space (and time)

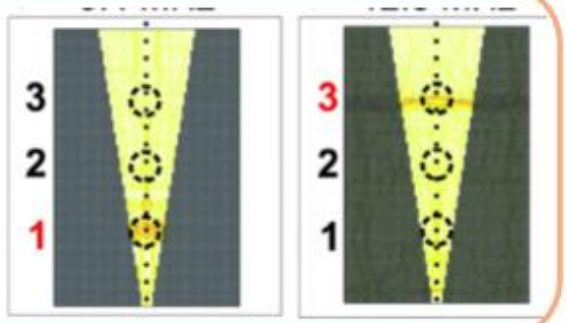




Phononics

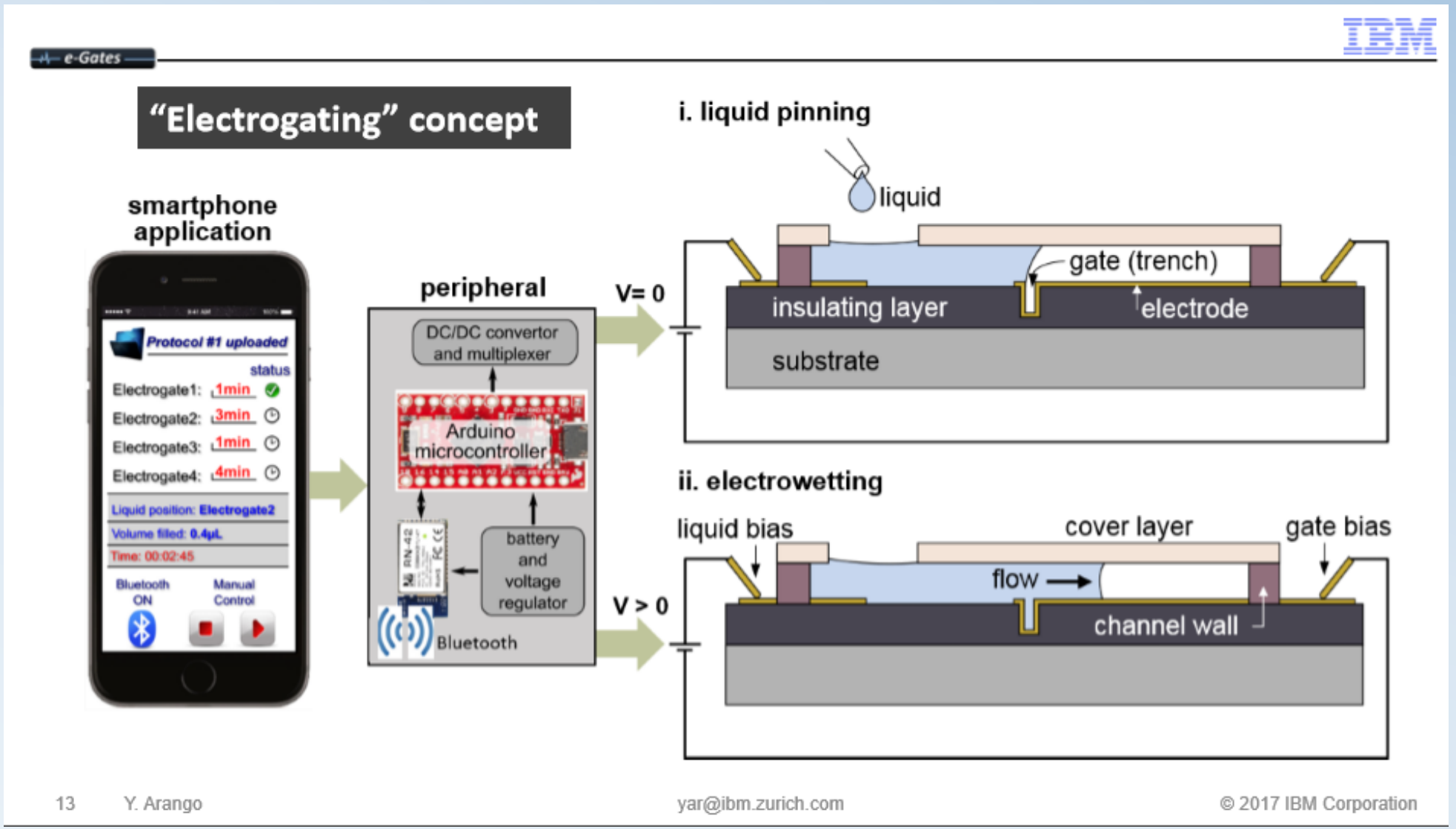
Stationary,
with functions defined
in the frequency domain using phononic
lattices

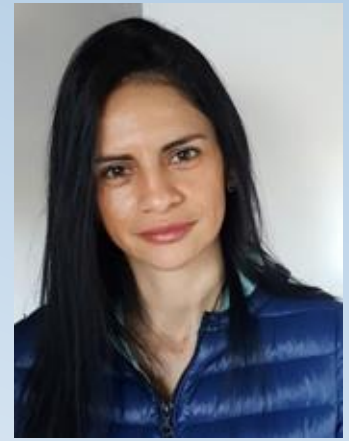




Dr Julien Reboud
SAW Dx Ltd

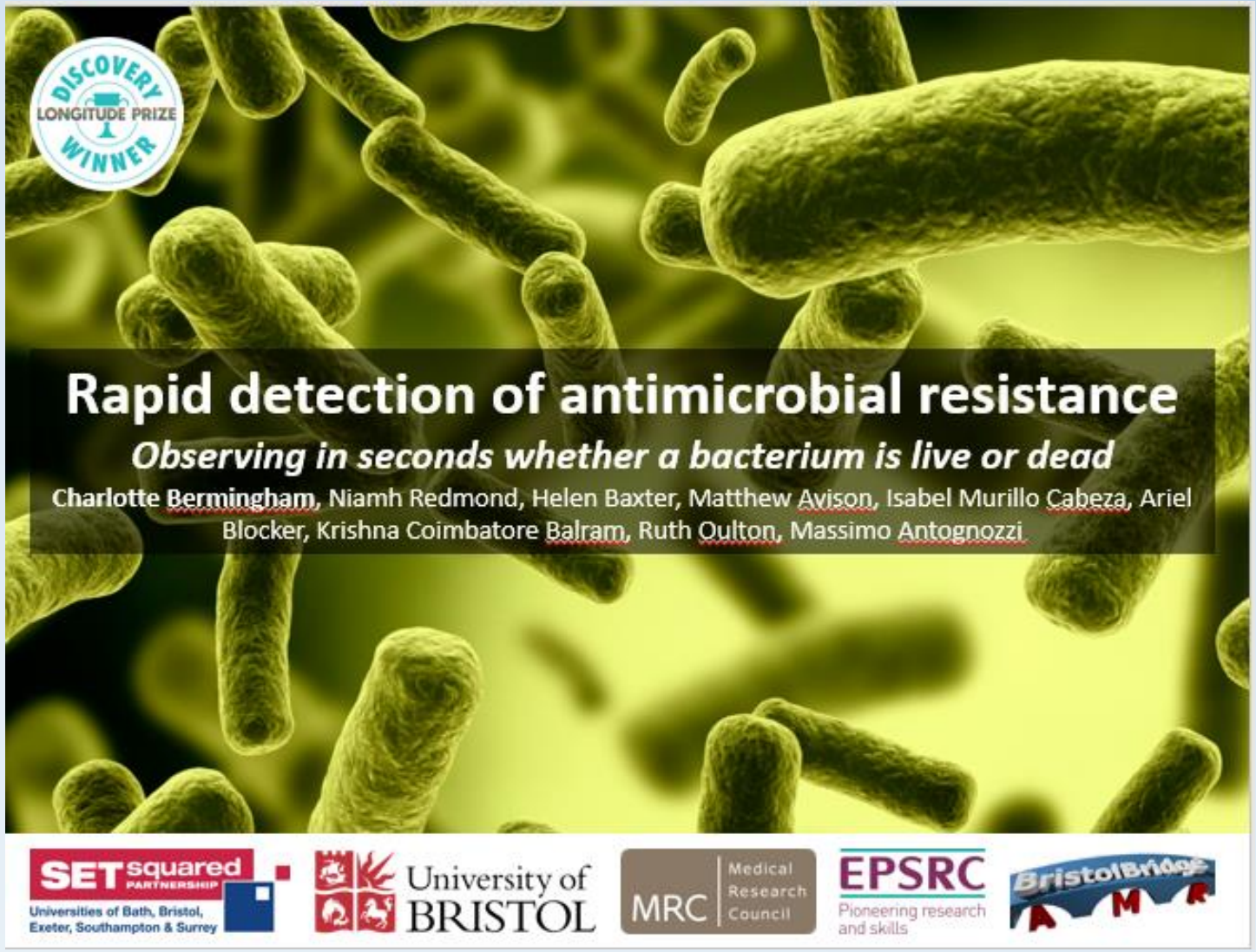
Integrating microfluidics functions on low-cost diagnostic devices for infectious diseases





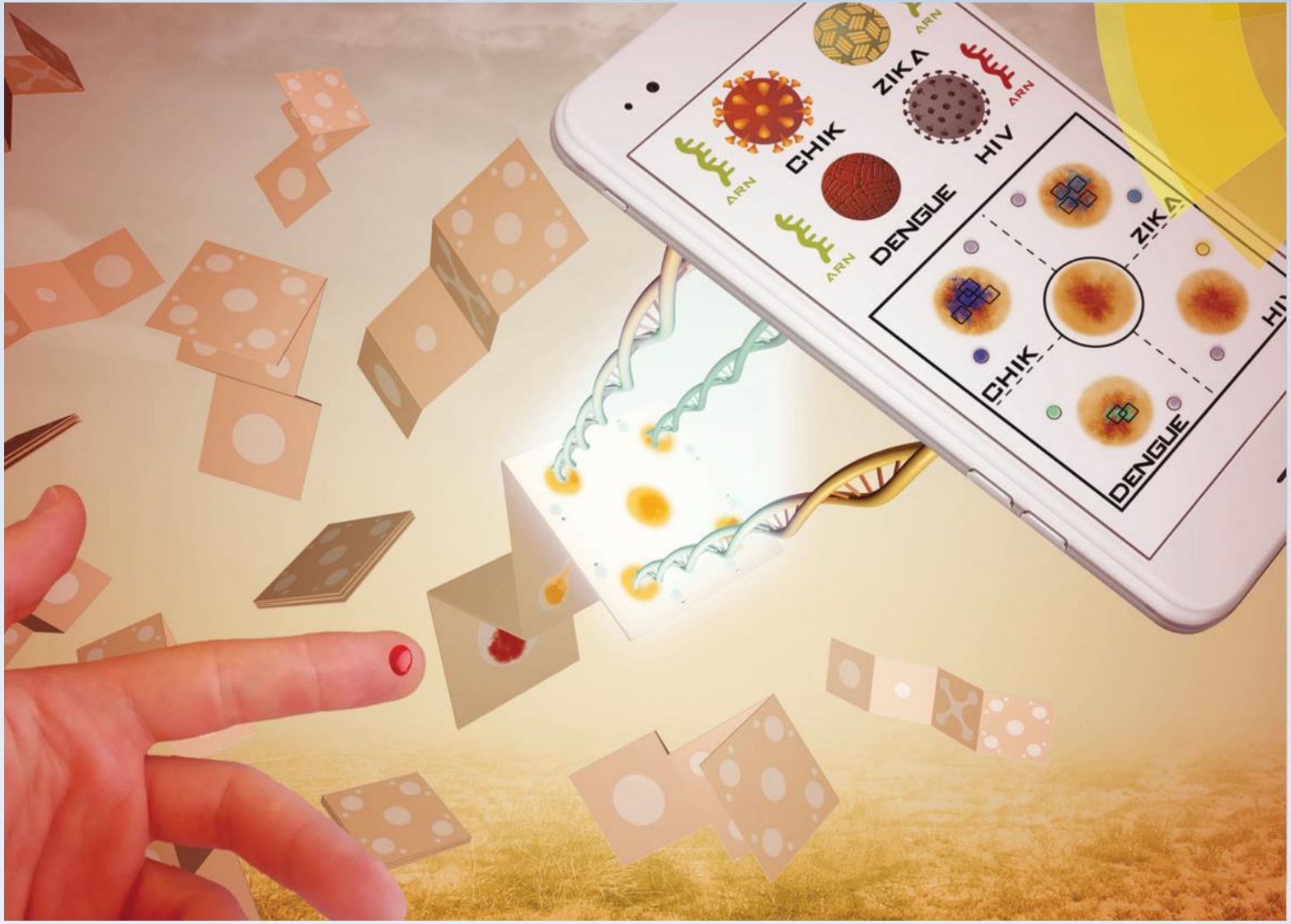
Dr Yulieth Arango
IBM Research Zurich

Stop-and-go control of liquid flow in microfluidics for flexible applications in mobile healthcare diagnostics



Dr Charlotte Bermingham
University of Bristol

Rapid Detection of Antimicrobial Resistance



Prof Jonathan Cooper
University of Glasgow

Origami enabling paper-based nucleic acid tests for the diagnosis of infectious disease in Uganda and India

Thursday October 5th –
Sensors for Cancer Diagnosis

- With 1 in 2 people forecast to be diagnosed with cancer the market potential for sensor based diagnostic devices exceeds all other applications – and they will have the greatest humanitarian impact
- Sensors for cancer diagnosis are being developed now:
  - Liquid biopsies – tests for molecules, cells and cellular fragments
  - Breath biopsies – tests for biomarkers in exhaled breath
  - Sensor platforms for multiple biomarkers

Sensors for Cancer Diagnosis

Prof Hossam Haick
Technion Institute of Technology
Israel

Hot Air or Hot Trail? Nanotechnology for Diagnosis Cancer from Exhaled Breath

NHS
National Institute for Health Research

ColonFlag – Validation

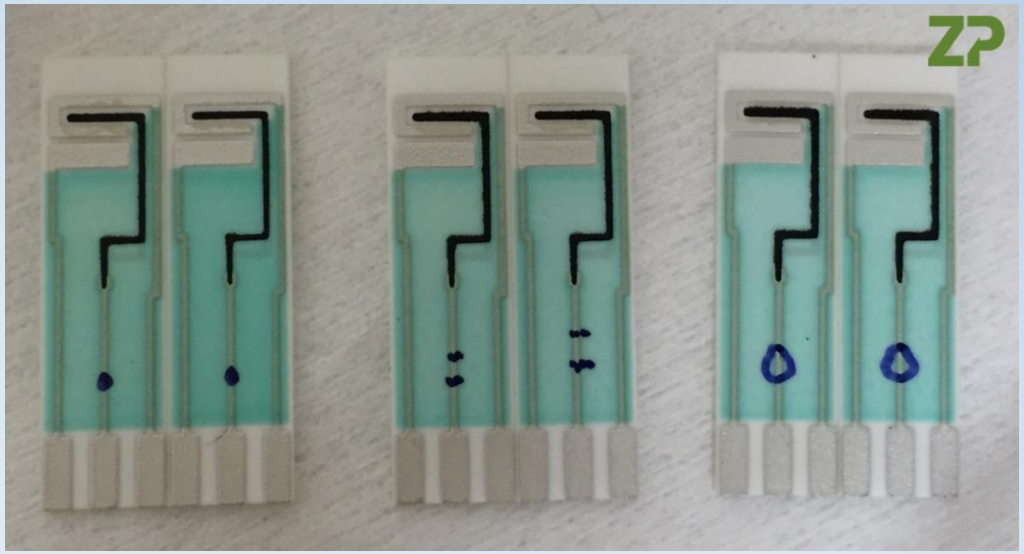
Assessing performance 3-6 months before diagnosis

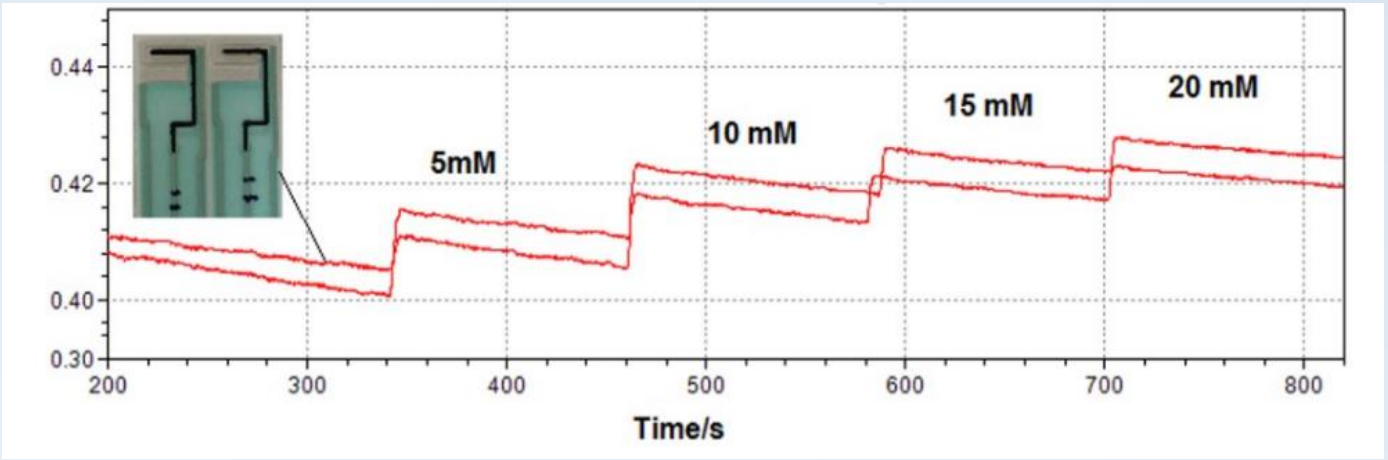
Results	Derivation	validation
Total number patients	606403	173251
Total number with a CBC	466107	139205
Mean age	58.7	58.6
% females	53.6	53.1
Number of cases	2437	698

Jacqueline Birks
Oxford Biomedical Research Centre

Early detection of bowel cancer using primary care electronic health records

K+





Dr Martin Peacock
Zimmer & Peacock

Bridging the gap between biosensor invention and biosensor commercialization

Dr Marc vand der Schee
Owlstone Medical Ltd

Breath biopsy for early cancer detection

The Cancer Challenge

Let's make this history

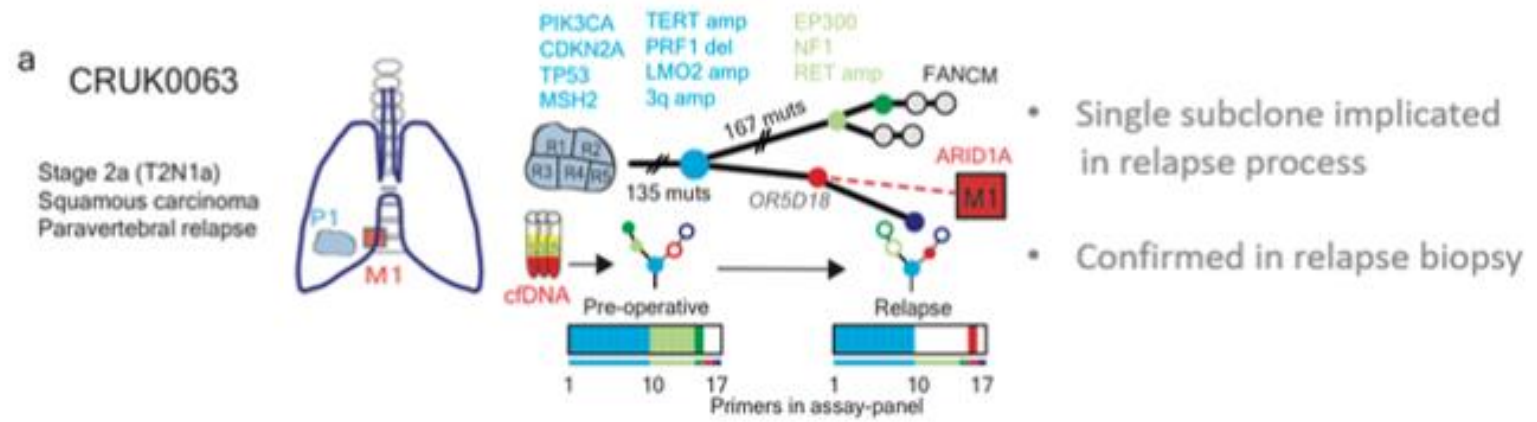
- ❑Find the best tests for early stage cancer
- ❑Make sure they get used

18

Dr. Michael Brand
Sensor100

Sensor100: Leading the challenge to find cancer biosensors

Phylogenetic characterisation of subclone driving relapse:



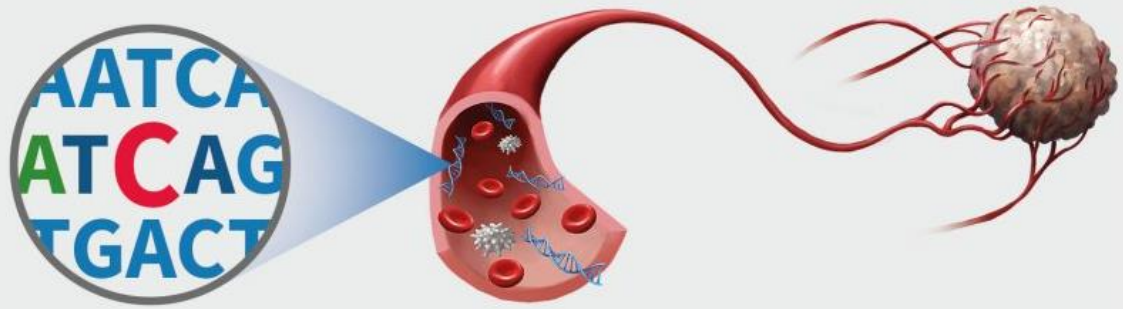
- Single subclone implicated in relapse process
- Confirmed in relapse biopsy

Dr Chris Abbosh
Francis Crick Institute

Targeted circulating tumour DNA profiling in early stage lung cancer

Circulating Tumor DNA

Diagram representing the release of ctDNA into the bloodstream by a tumor. ctDNA can be distinguished from other cell-free DNA of non-cancerous origin by the presence of cancer-specific mutations.



Liquid biopsies are able to isolate the tiny amounts of ctDNA released by the tumor from the background cfDNA, by identifying hallmark genetic mutations.

Inivata is developing some of the most sensitive techniques available to isolate this ctDNA and identify a broad range of disease-specific mutations.

Dr Vincent Plagnol
Inivata Ltd

The critical role of analytics in the development of circulating DNA assays for cancer

WHY AREN'T PEOPLE BEING DIAGNOSED EARLY?

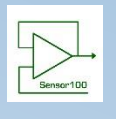
THERE ARE MANY REASONS INCLUDING:

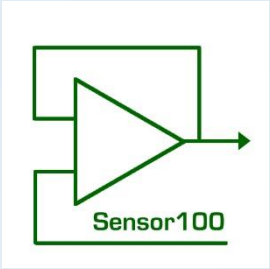
- **PATIENT FACTORS**
- **SYSTEM AND HEALTHCARE PROFESSIONAL FACTORS**
- **ISSUES WITH DIAGNOSTIC TESTS**

Sara Bainbridge
Cancer Research UK

Testing Times: Progress and challenges in achieving earlier diagnosis of cancer

SiM17 Exhibitors



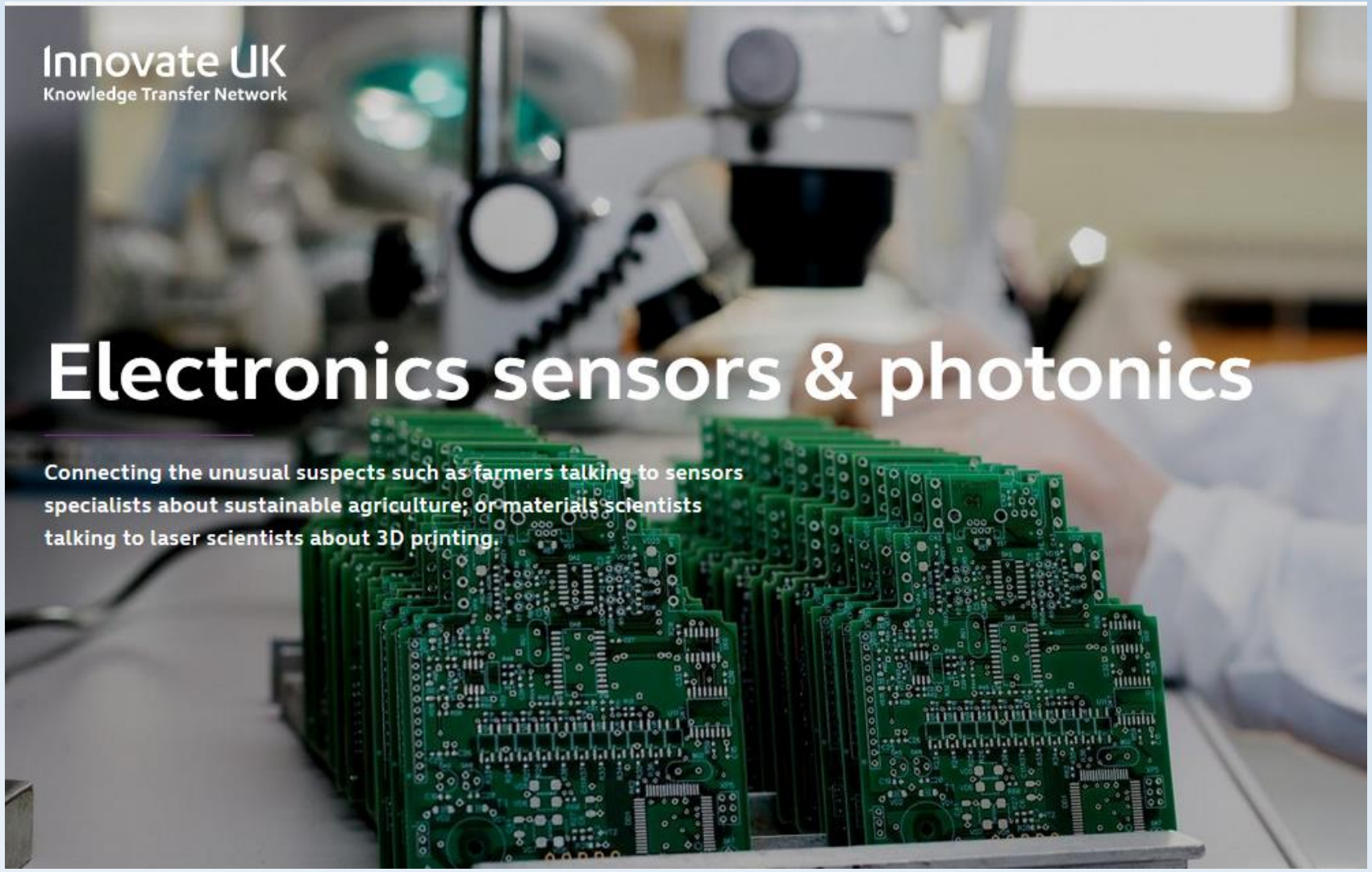


Exhibitors were invited to give a short "Elevator Pitch" during the conference

Exhibition

Leonie Hilliard
Senior European Sales Manager
Biodot Ltd.

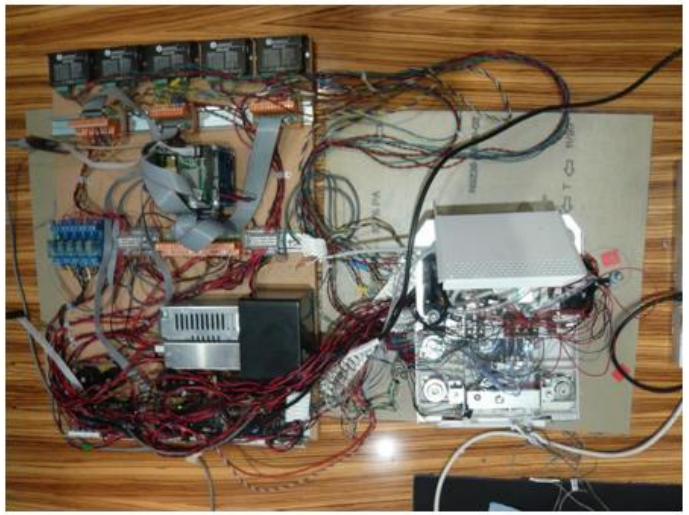
Biodot



KTN

Dr. Ligun Yang
Knowledge Transfer Manager
Innovate UK

Atlas io™: POC instrument development



October 2012

January 2014

ttp | The Technology Partnership

Dr. Alex Wilber
Consultant
TTP

TTP

The technology development roadmap and revenue

Idea

Are there products and services that you can offer along the way

Early Product

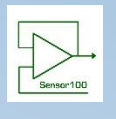
Product

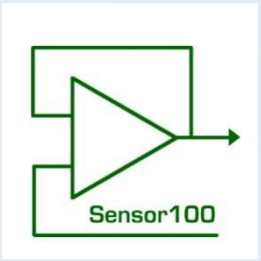
Zimmer & Peacock

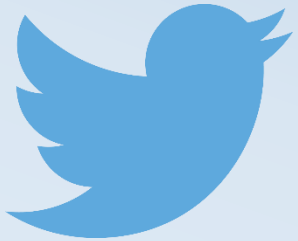
Pavel Zhurauski
European Technical Sales Manager
Zimmer & Peacock

Zimmer & Peacock

Sensor100 gratefully acknowledges support of its media partners:







Media Partners

- **Sensor100:** The international network of people and organisations active in development and commercialisation of bio- and chemo- sensors
- Formed in 2011, now has over 3000 members in over 70 countries
- Publishes a monthly eNewsletter, distributed free of charge
- 2018 Conference series:
  - **Sensors in Medicine**
  - **Sensors in Food and Agriculture**
  - **Sensors for Cancer Diagnosis**
  - **Artificial Intelligence in Medicine**
  - **Diagnosis in Resource Limited Environments**

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www.sensor100.com

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United Kingdom

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