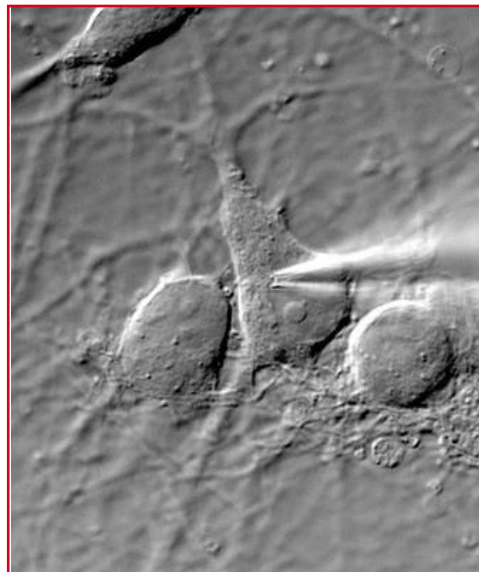
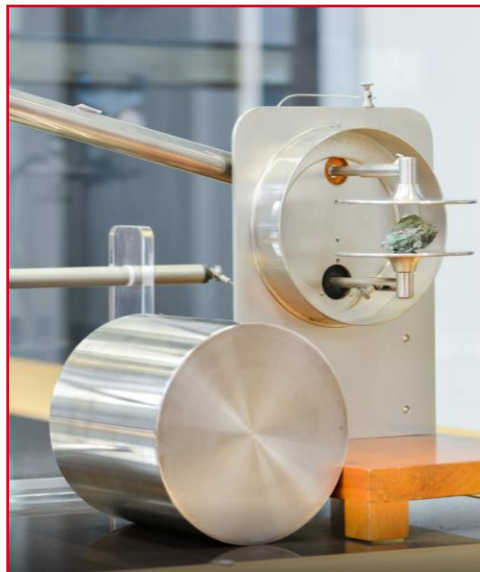


The role of research methods innovation in scientific breakthroughs

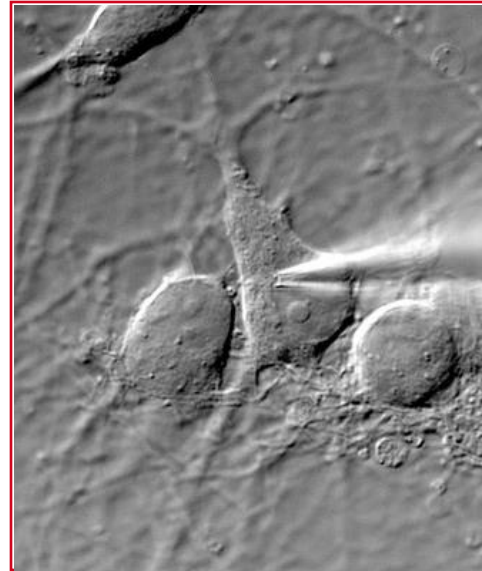
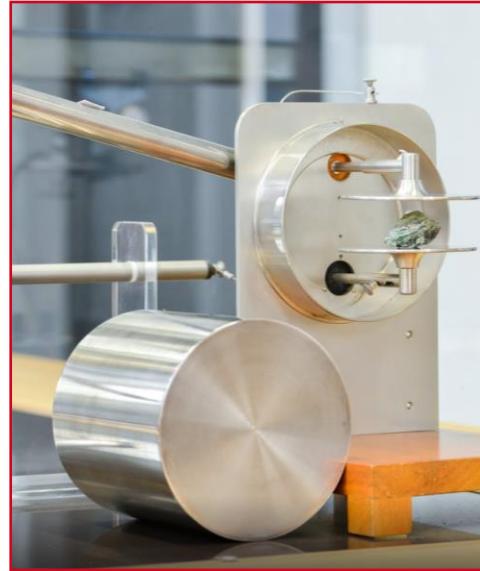
Dr. Piers Mahon

Thursday 4 November, 13.30 to 15.45 CET





Methods revolutions drive scientific revolutions...



The Compound Microscope

1595

Zacharias Janssen

Aged 15

Holland

Celsius' Thermometer

1742

Anders Celsius

Aged 41

Sweden

Ionisation Electrometer

1898

Marie Curie

Aged 31

Poland & France

The Patch clamp (electrophysiology)

1974

Erwin Neher and Bert Sakmann

Sakmann

30 & 34

Germany

Capture plate for single cell genomics

2011

Sarah Teichmann &

Affymetrix

Aged 36

Country UK & Germany

Take homes



1. Methods revolutions drive Scientific revolutions

2. The tool-maker scientist quickly professionalises

3. Methods innovation is generally a young person's game

4. Europe is good at this

5. But this time there is a human in the machine



Published: 16 June 2013
Mutational heterogeneity in cancer and the search for new cancer-associated genes

Michael S. Lawrence, Petar Stojanov, [...] Gad Getz

Nature 499, 214–218 (2013) | Cite this article



31 Years

(average age of inventor)

224 of 338*

Nobel Prizes in Chemistry, Physics, Physiology & Medicine



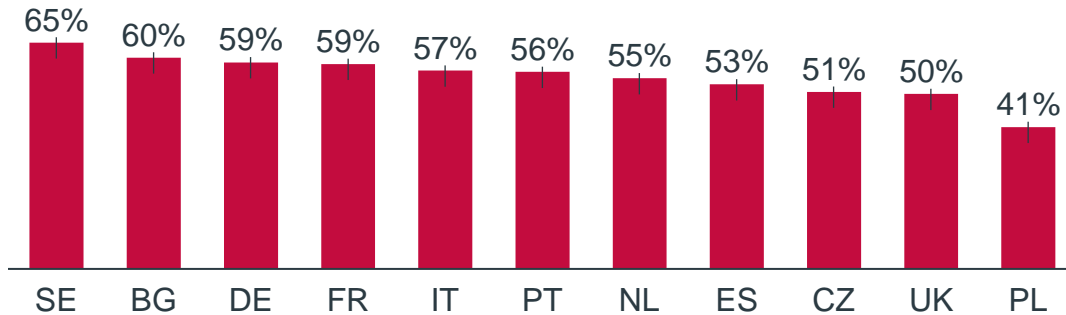
*Total n = 603 Nobel prizes in Economic sciences. <https://www.nobelprize.org/prizes/facts/nobel-prize-facts/> of which 338 were in Chemistry, Physics, Physiology & Medicine
Nobel prizes in Physics, Chemistry & Medicine by EU country are Austria (16), Belgium (6), Croatia (2), Denmark (9), Finland (2), France (37), Denmark (91), Hungary (11), Ireland (1), Italy (13), Lithuania (1), Luxembourg (2), Netherlands (15), Norway (5), Poland (8), Portugal (1), Romania (2), Spain (2), Sweden (17)

Why does this matter



Save tens of thousands of lives every year by closing the quality gap

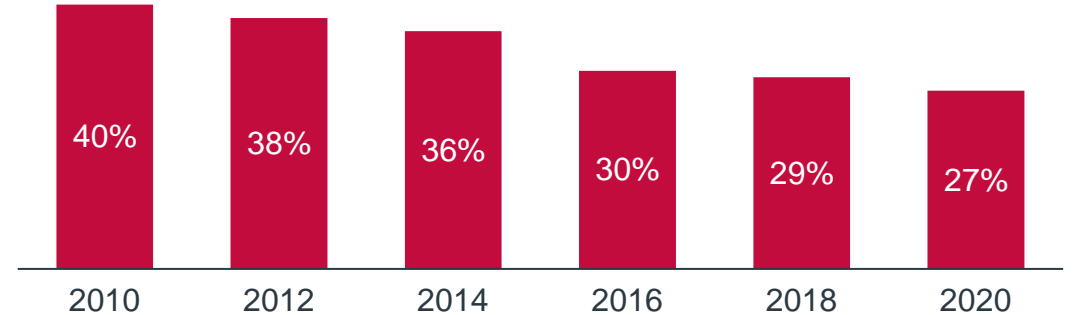
Cancer 5 year survival (EU countries with over 10m population)



Source: Eurocare5, Cancer Research UK

Opportunity to improve EU share global trials >10%

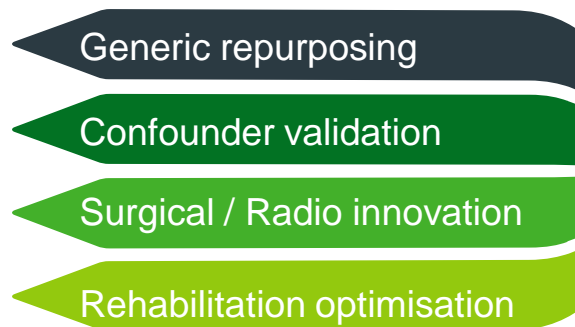
Proportion of R&D commercial spend on PHIII clinical trials in EU



Source: clinical trials.gov (total n. of studies in 2010 (57), 2012 (63), 2014 (73), 2016 (75), 2018 (93), 2020 (83))

Create a swift path for non-commercial innovation uptake

Innovation with no salesforce



Actionable Analytics

Front Line uptake



Use analytics and health economics to switch off legacy care pathways and switching on effective innovation



National confounder testing programme

Source: Prof. Fabien Calvo, personal communication

Gefitinib, KRAS lung cancer

- Testing: €1.7M p.a.
- Drug costs saved: €69M
- **Net €67M**

DIGICORE is a pre-competitive environment to drive the methods revolution in oncology clinical informatics



Structural protections for cancer centres

- 1 member 1 vote, cancer centres in majority
- Data under cancer centre control
- Only perform protocolised research
- Research sovereignty and autonomy (a centre can refuse any protocol)
- Non-exclusivity
- Fair market value for research

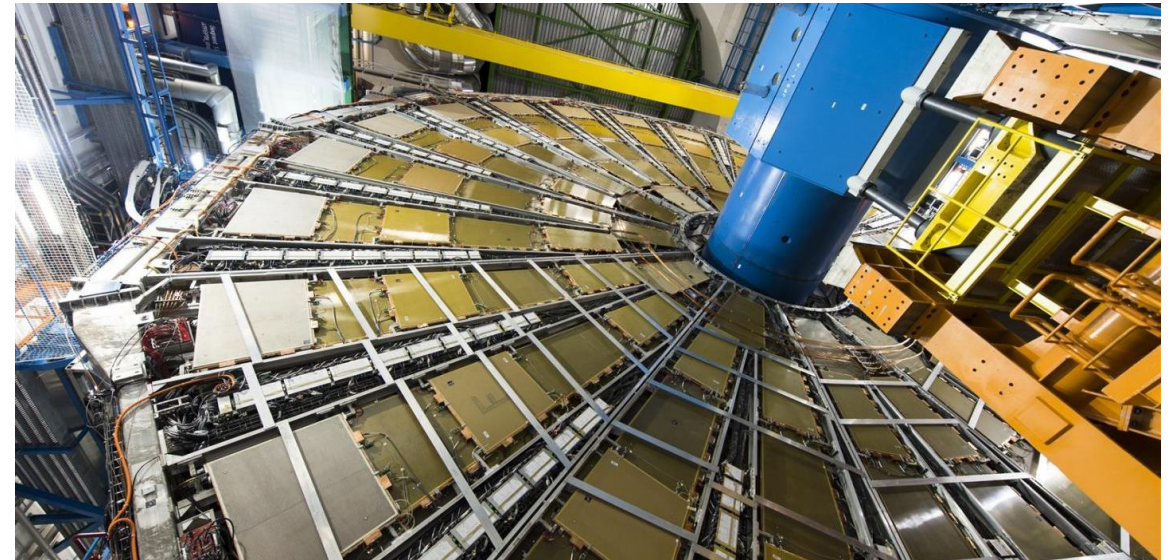
We are building towards “the CERN or Diamond light source for Cancer” to unlock cancer’s secrets and transform outcomes

Diamond light source: most powerful cyclotron (X-ray source) on the planet



**Fixed beam time capacity:
half given to “best academic science”,
half sold to commercial at high price**

CERN: largest atom smasher on the planet



**2,500 employees,
of which ~1,000 engineers**

A framework for direct-from-EHR Real World methods




Description

GDPR

Status

Enhanced 

An international multi-centre study that uses **native local structured data** where available & targeted **manual enhancement of essential unstructured data**, imported into a study specific common data model

OMOP database 

Using centres that have implemented **cancer OMOP** on their EHR to allow protocolised research using **centrally developed scripts**.

Only structured data is analysed as a result

Patient level 

Studies that required the **release of high quality patient level data** for either regulatory requirements such as case controls to single arm trials, single biomarker validation or discovery 'omics type applications

Next Generation 

Advanced use cases that need **large, complex, federated, medical-device accredited networks** for the flexible delivery of a broad range of precision oncology research at regulatory quality (e.g., off-label cohorts, MDX validation, biomarkers of response, pragmatic trials, platform trials, digital pharmacovigilance etc.)

Release of **aggregated data** with bin size $n > 5$ patients with any legal basis for research processing using **meta-analysis** to get the network wide results

Routine broad consent in place covering data, genomics and samples allowing **patient level data release** and filing with international regulators

Bronze Centres

Silver Centres

Gold Centres

Platinum centres

