



HEALTH.E

## LIGHTHOUSE INITIATIVE

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Accelerating innovation in smart medical devices

*Enabling “Moore for Medical”*

Ronald Dekker (ronald.dekker@philips.com)

ECSEL JU Health.E lighthouse  
Philips Engineering Solutions



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Joint Undertaking



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# Healthcare is changing:

Hospital → Point of care, home

M€ Diagnostics → Semi-professional

Blockbusters → Personalized therapy

Pay for treatment → Pay for cure

Cure → Prevent

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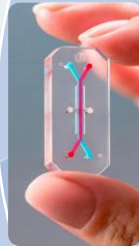
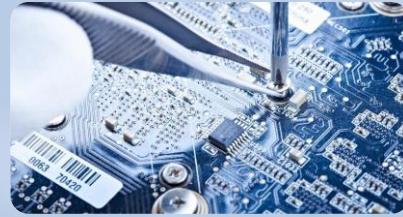


# Fading Borders

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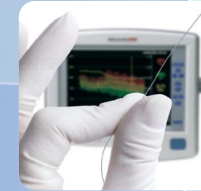
## ECS



Organ-on-Chip



wound care



smart catheters



electroceuticals



data



e-health



drug administration



point-of-care diagnostics



## Pharma

## Medtec

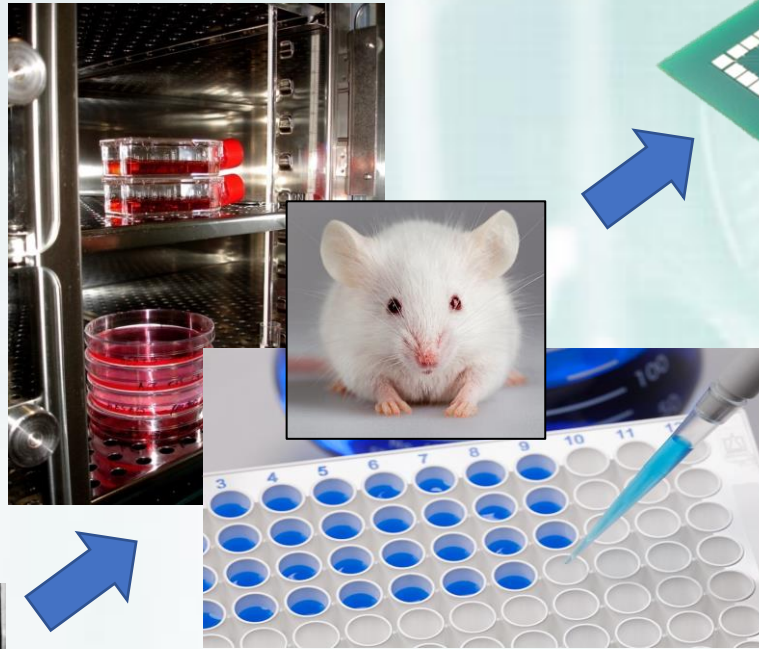
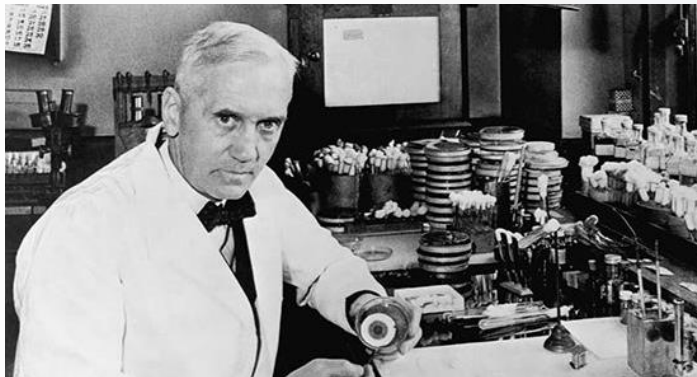




# Organ-on-Chip

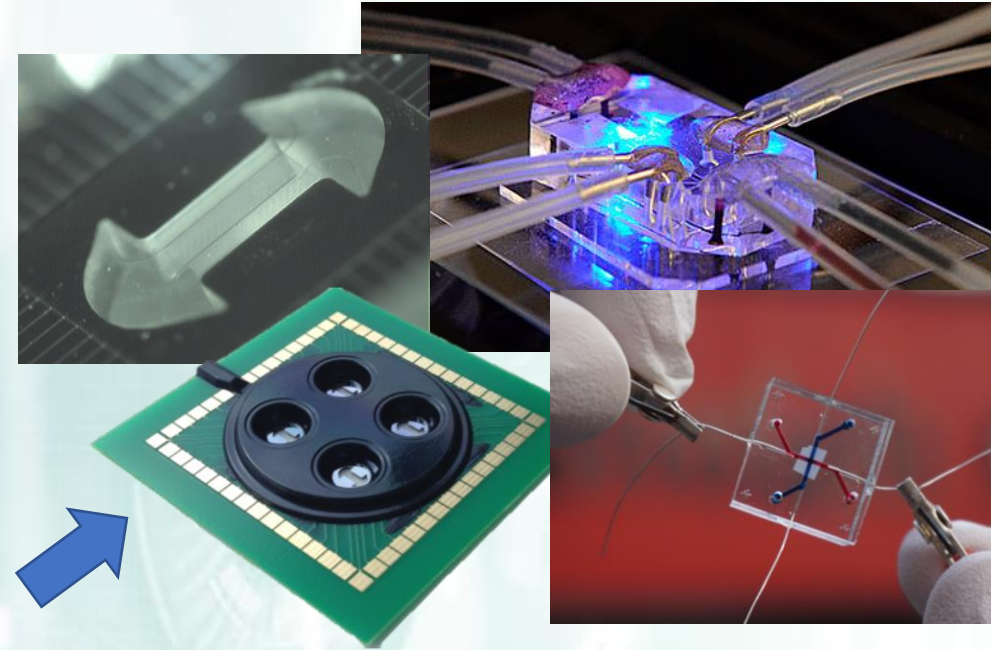
- Human tissue and disease models for:
- Drug development (target discovery and screening)
- Drug repurposing
- Personalized medicine
- Safety pharmacology
- Food and cosmetics testing
- Reduction of animal experiments

Alexander Fleming 1928



2019 parallelism

## Organ-on-Chip



iPSC derived human cells form mini organs in a micro-fabricated physiologically relevant environment

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Definition of a European roadmap for Organ-on-Chip



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# Bioelectronic Medicines

Replace or complement traditional medicines:

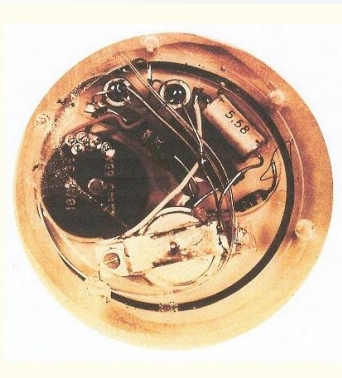
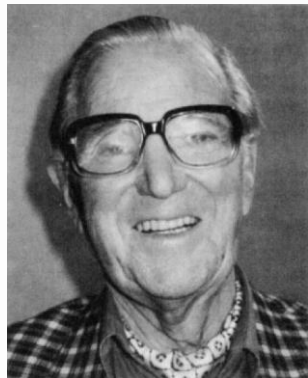
Pain relief, inflammatory diseases (Crohn, Arthritis) , hypertension, obesity, sleep disorders, cardiac rhythm, diabetes, .....

**Selective** - targeting chronic diseases

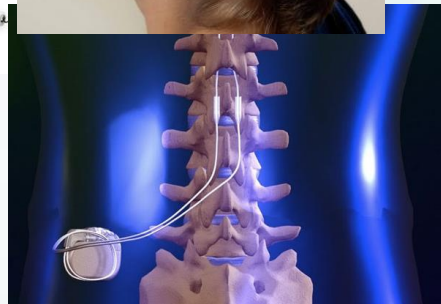
**Smart** – closed loop systems

**Small** – minimally invasive

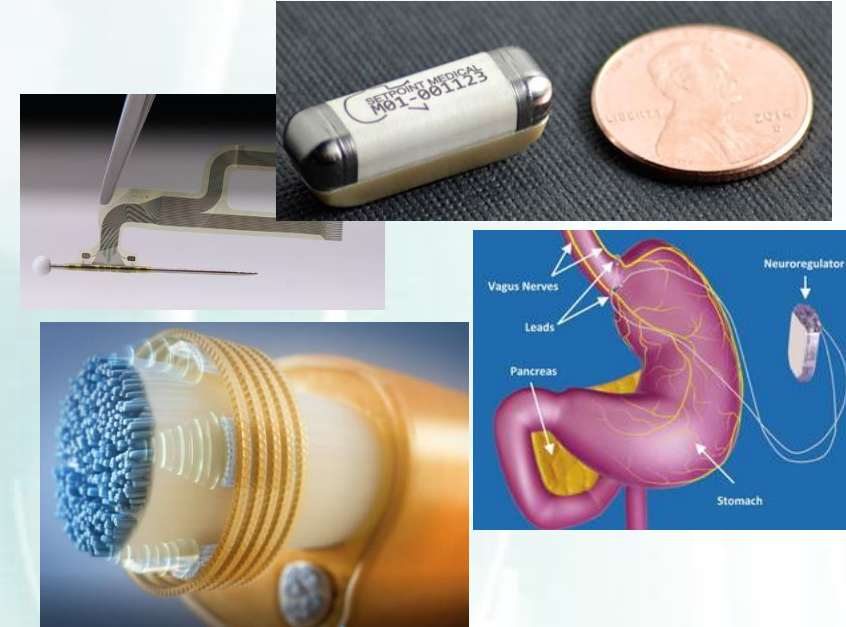
Arne Larsson 1958



2019



## Electroceuticals



Small (polymer) encapsulated devices that directly modulate nerves leading to specific organs.

GSK and Google invest \$715M in bioelectronics venture Galvani



The SRC is actively defining a US roadmap for bioelectronics







# Personal ultra sound

Diagnostic imaging is moving from the hospital to semi-professionals and consumers

MEMS ultrasound enables high volume consumer applications



3D ultra sound

2D ultra sound



A huge challenge for established players, a huge opportunity for new comers!

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# Wound care

Only replace bandage when needed

Remote monitoring

Sensors: pH, moisture, temp

LF US for healing

HF US for monitoring

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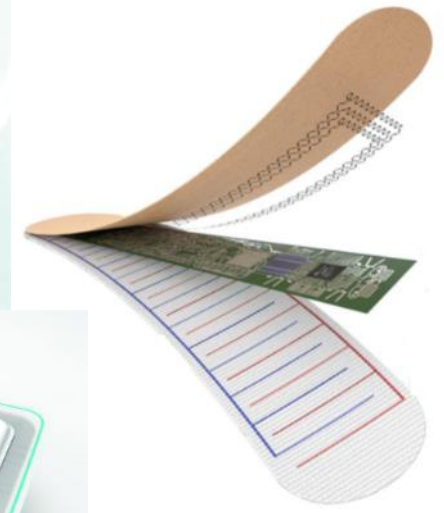
2018



## Chronic wounds



## Smart wound dressings



Electronic sensors and ultra-sound combined in a textile for chronic wound monitoring and therapy

Chronic wound care adds up to €13B/yr in 2025 world-wide





# Device level innovation is slow compared to ECS norm

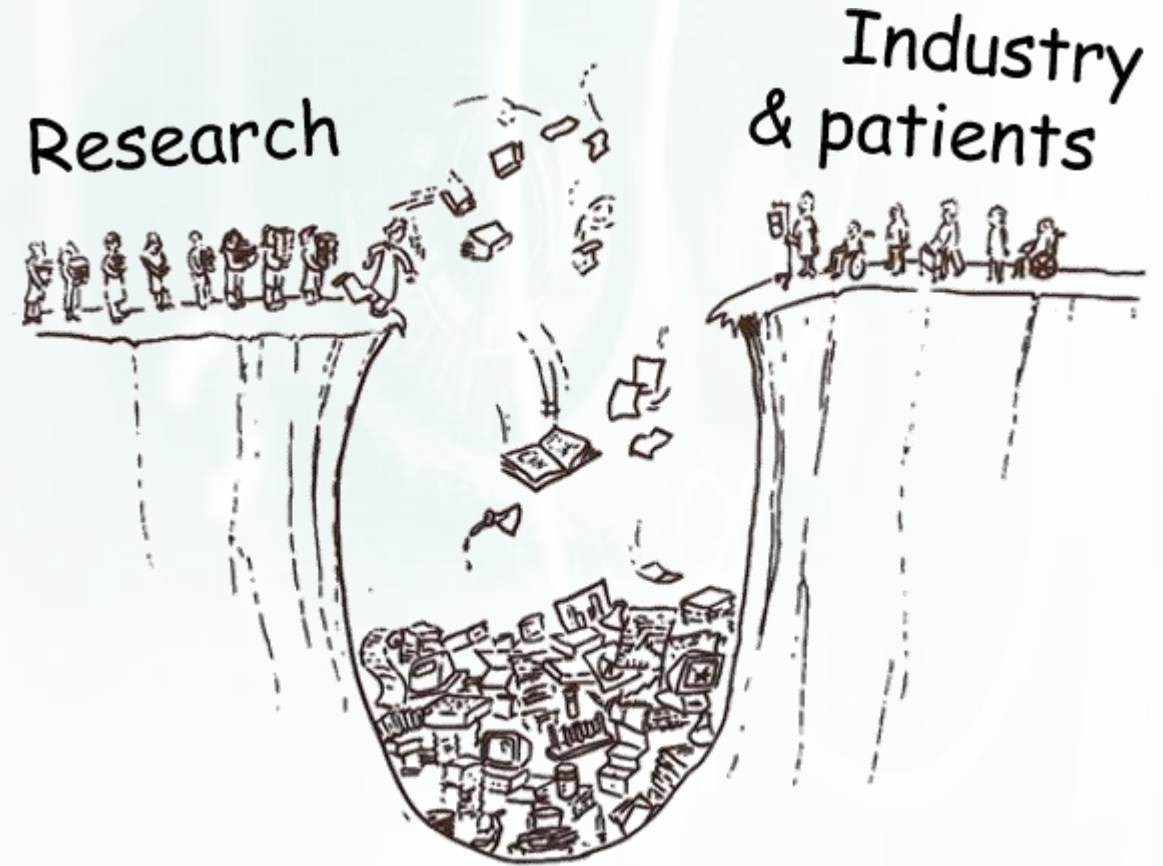
## Causes:

- Non-standard fabrication
- (Quality) regulations
- Lack of standards

## But above all:

- Fragmentation
- Small volumes
- Point solutions
- Lack of open technology platforms!

It's not because of the lack of innovative ideas!







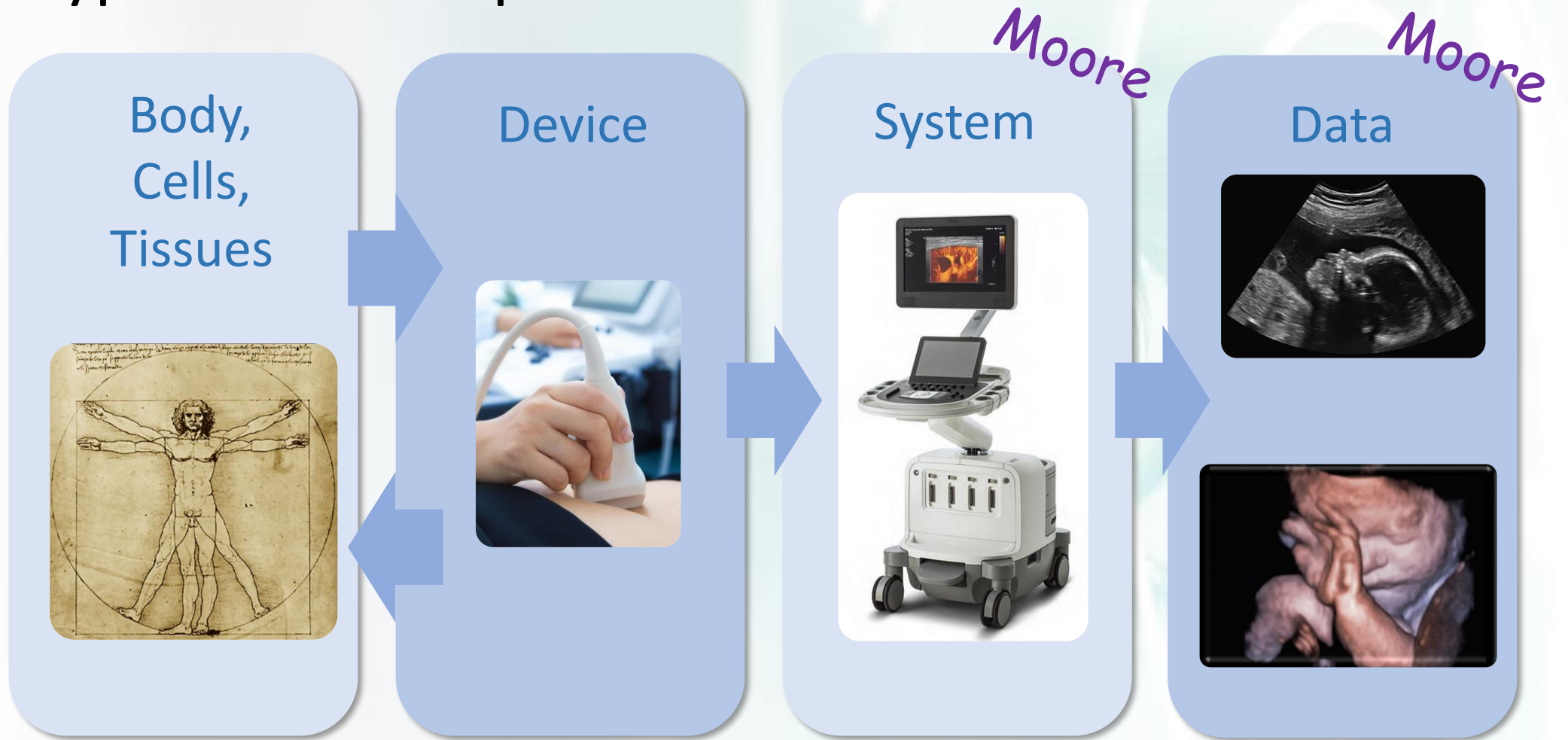
# Consumer products



- Open platforms and standards at all levels
- Volumes drive innovation



# Typical medical product



- Relatively small volumes
- Innovation gets stuck at device level due to lack of open platforms



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Vision:

“Moore for Medical”

Mission:

Motivate the ECS community to work towards open technology platforms for medical devices on a device, system, and data level







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## What is a Lighthouse?

Lighthouses signpost subjects of common European interest:

- Established by ECSEL/KDT JU ppp,
- Audience is the Electronics Components and Systems (ECS) industry
- Develop a mission and vision,
- Contribute to roadmaps,
- Work across platforms (JU's, Eureka, H2020, National),
- Clustering of projects.

Three lighthouses: Industry4.E, Mobility.E, Health.E

(<https://www.ecsel.eu/lighthouse-initiatives>)





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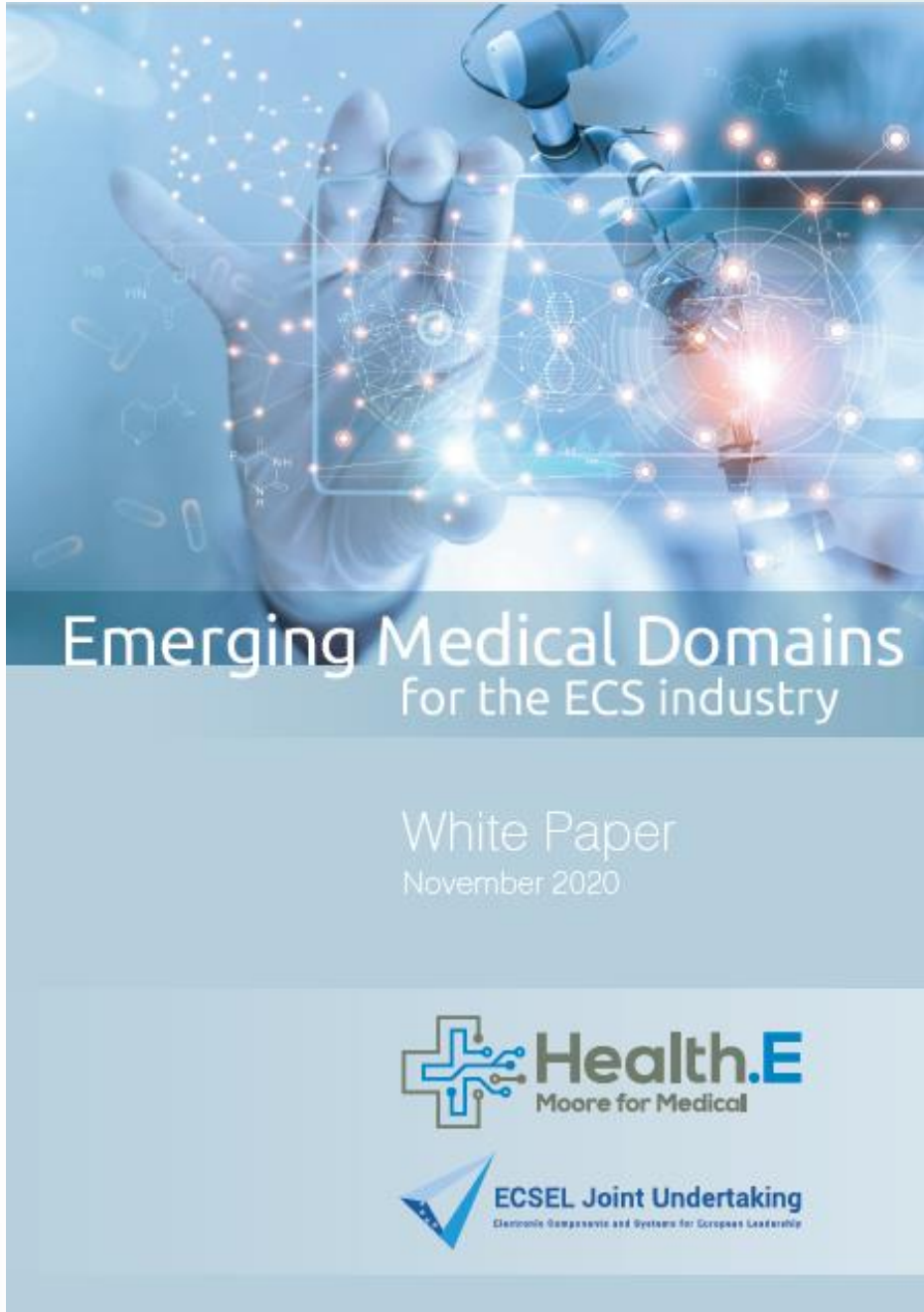
## Health.E lighthouse:

- **Create Awareness** in the ECS community for emerging opportunities
  - Translate the needs of MedTech and pharma into ECS language
  - Identify gaps in strategic research agendas (SRA)
- **Promote Open Technology Platform** model for medical technologies
  - Funnel innovation for medical devices (reduce fragmentation).
- **Create a Sustainable Ecosystem**
  - Consisting of technology suppliers, device manufacturers, end-users
  - Transcending project boundaries
  - Connect to other European initiatives and communities

*Make Europe the innovation hub for medical devices.*



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An introduction to 13 emerging medical domains that offer opportunities to the ECS community

Available from:

Health.E website: [https:// www.health-lighthouse.eu](https://www.health-lighthouse.eu)

ECSEL JU website: <https://www.ecsel.eu/publications>

Second whitepaper to be published soon!

# Open Technology Platforms for Emerging Medical Domains







# Cardiac interventions

Smart catheters assist in coronary interventions, structural heart repair, electrophysiology procedures

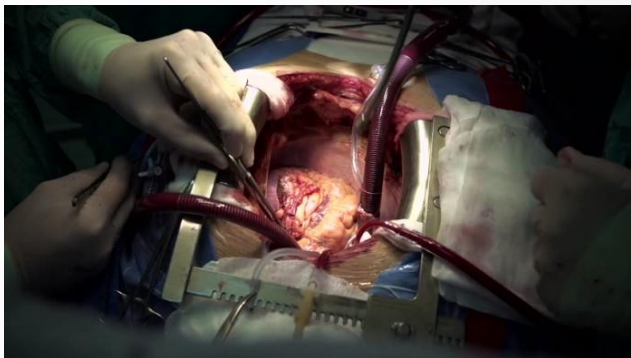
Next generation smart catheters:

Analog → digital

Conventional → MEMS

Point solutions → open platforms

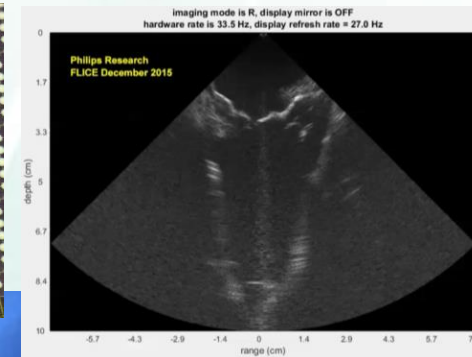
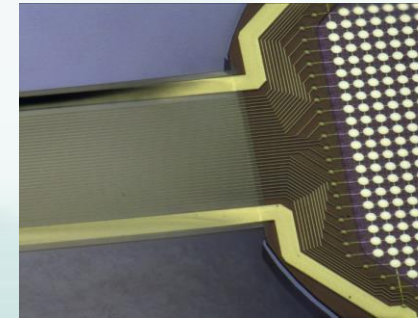
(open) heart surgery



2019

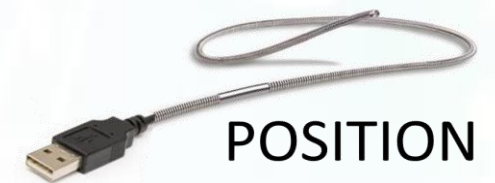


## Next generation smart catheters



Digitization at the tip leads to serialization of data leading to standardization in communication

minimal invasive procedures assisted by smart catheters



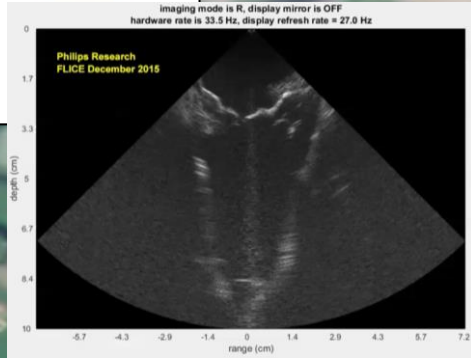
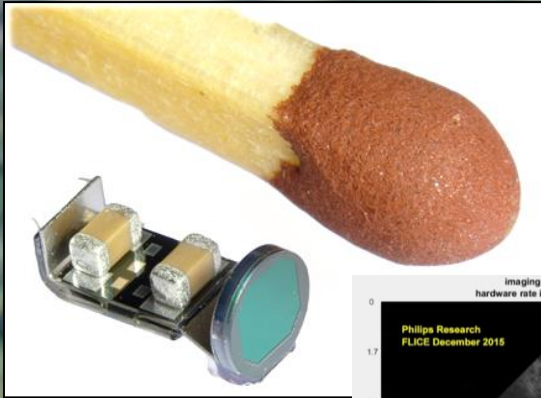
Grant no.: Ecsel-783132-Position-II-2017-IA

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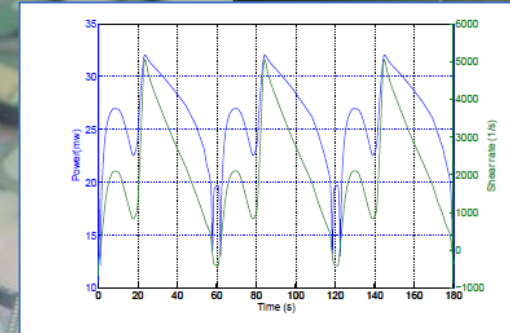
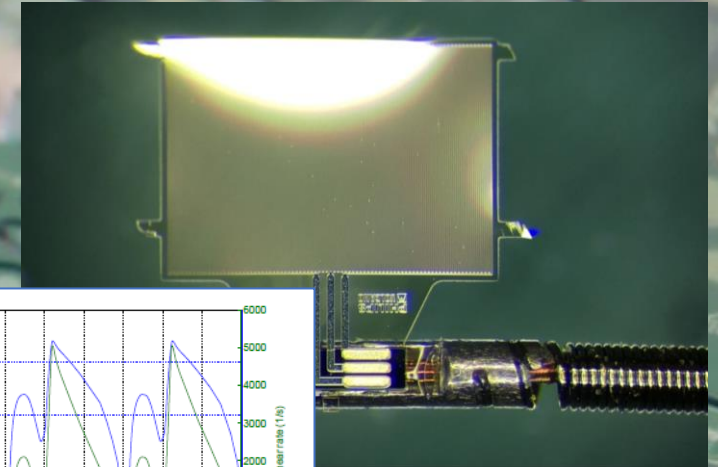




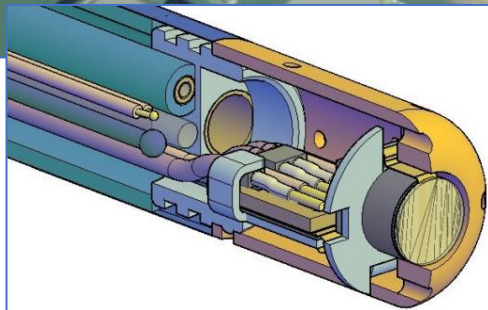
# Flex-to-Rigid, an open platform for smart catheter applications



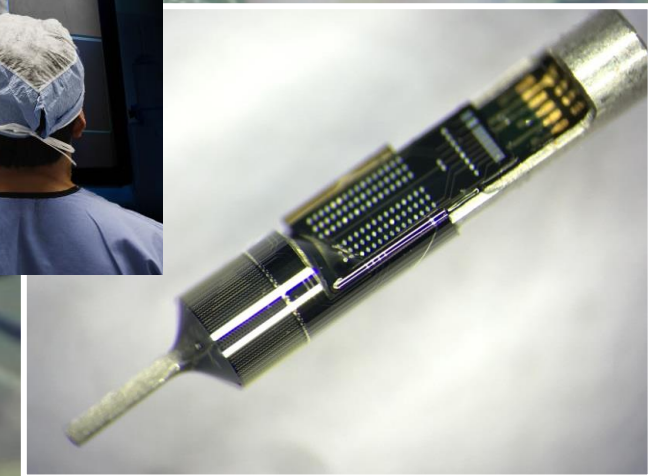
ICE  
Intracardiac  
echography



Flow  
IVUS  
Intravascular  
ultrasound











Ablation and electrophysiology





# CMUT, an open platform for ultrasound diagnostics



Low frequency		Medium frequency			High frequency		
							
Echocardiography	Abdominal	Therapeutic	Gynaecology	TEE	Vascular	ICE	IVUS
1-5 MHz	2-5 MHz	4-8 MHz	5-10 MHz	5-10 MHz	5-15 MHz	5-20 MHz	20-50 MHz





## Philips MEMS & Microdevices

- Offering MEMS prototyping, development, manufacturing & micro assembly
- Open technology platforms for MEMS ultrasound, smart catheters and bioMEMS
- More than 160 experts making innovation work for internal and external customers
- Up to 15.000 wafers/year ISO13485
- Based in Eindhoven @ High Tech Campus





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Takeaways:

- The changes in healthcare offer great opportunities for the ECS industry and patients
- It will require open technology platforms and standardization to make it happen

Save the date !



8/9 March 2022



Symposium on open technology platforms for emerging medical devices  
High Tech Campus, Eindhoven [www.health-lighthouse.eu](http://www.health-lighthouse.eu)



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# Acknowledgements:



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