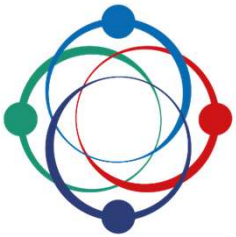


HETEROGENEOUS
TECHNOLOGY
ALLIANCE

Mario El-Khoury

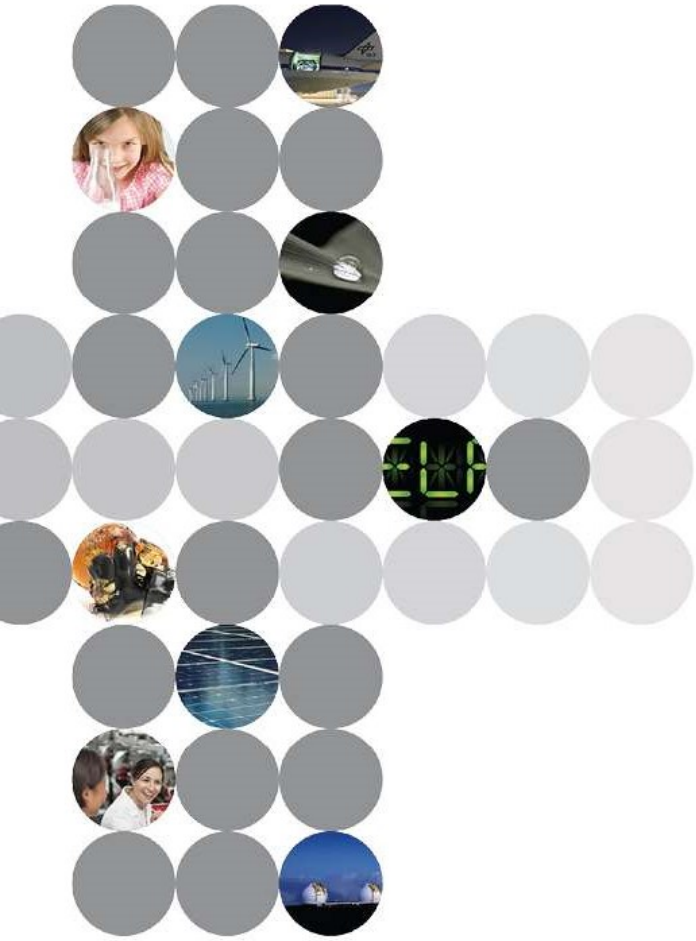
CEO of CSEM

csem

cea

VTT

Fraunhofer
MIKROELEKTRONIK



Swiss microtechnologies in the European innovation ecosystem

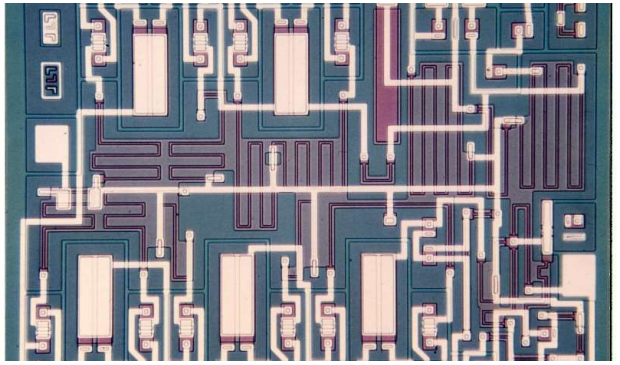
Mario El-Khoury
CEO

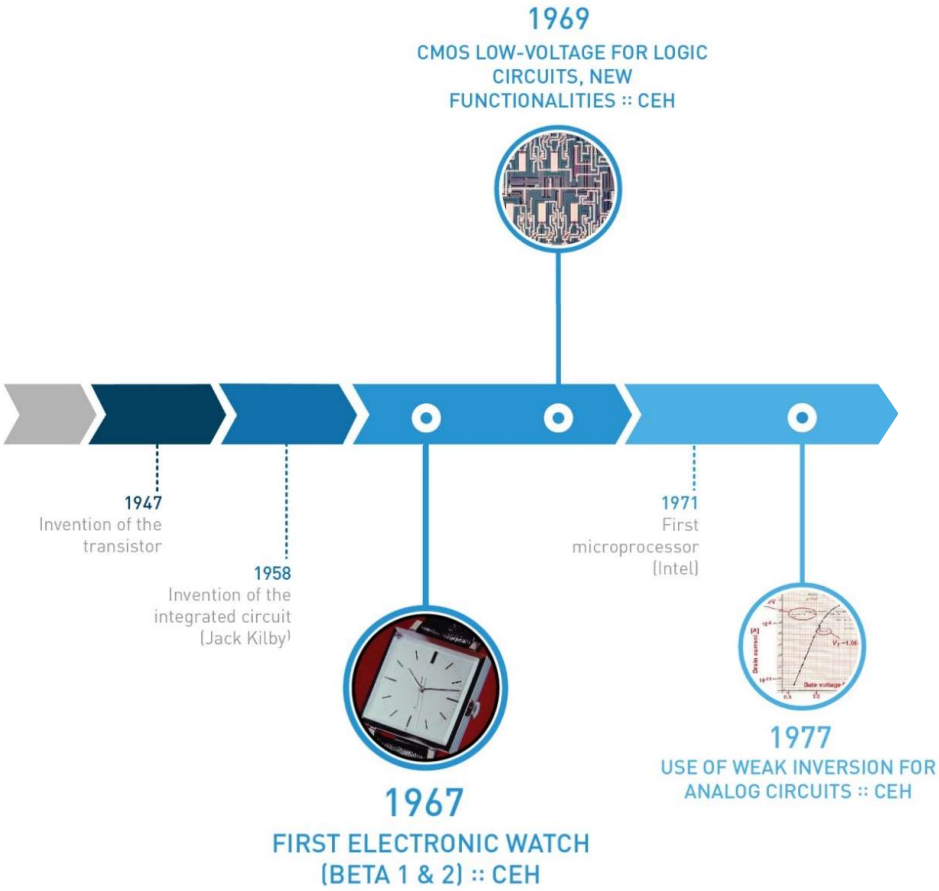
A ubiquitous technology in our daily live

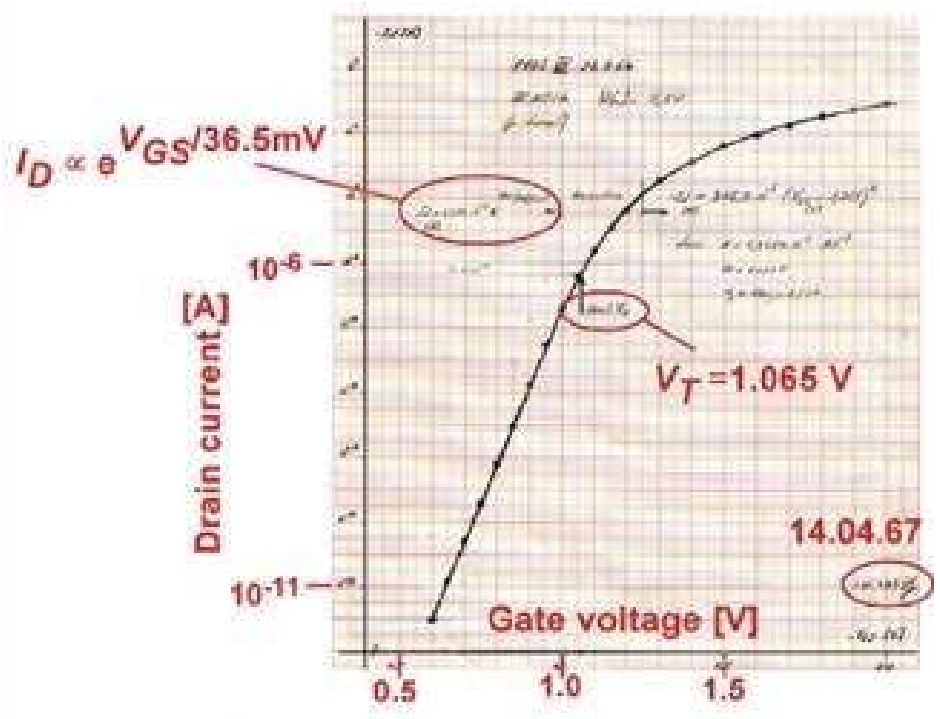
1967 – The first integrated wearable device

© Cartoonist Wildt, Chris

An innovation that changed the nature of watchmaking







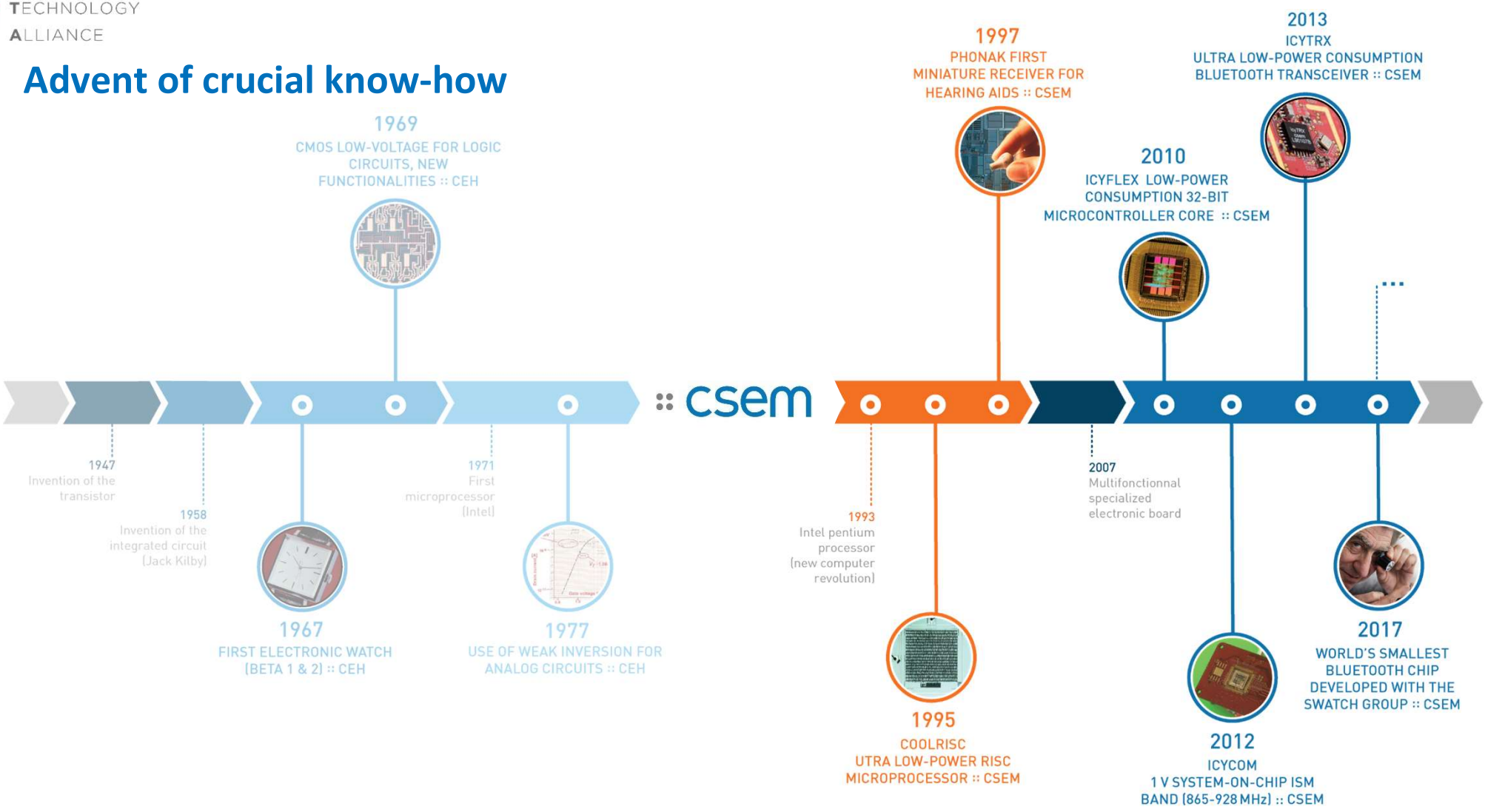
1984

is born!


Mission
Economic competitiveness
and jobs in industry

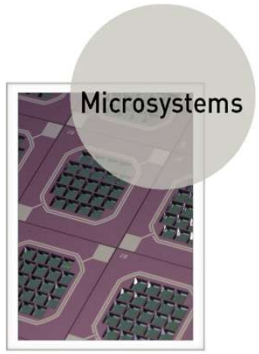
HETEROGENEOUS
TECHNOLOGY
ALLIANCE

Advent of crucial know-how



HETEROGENEOUS TECHNOLOGY ALLIANCE

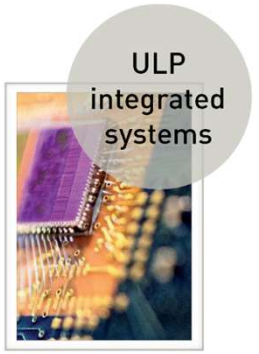
Technology platforms to foster innovation



- MEMS
- Functional packaging
- Advanced micro-manufacturing

- Printable electronics
- Nano-surface engineering
- Bio-surface engineering

- Automation
- Scientific instrumentation
- Medical technologies



- Vision systems
- System-on-chip
- Wireless

- PV cells & Modules
- Energy systems
- Emerging & thin-film PV

- Industry 4.0
- Advanced manufacturing
- IoT
- e-health
- e-energy

csem cea VTT Fraunhofer MIKROELEKTRONIK

HETEROGENEOUS TECHNOLOGY ALLIANCE

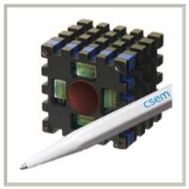
Disruptive developments – a story of “firsts”

1991 — The first commercial standalone AFM in Europe

1993 — The first optical mouse in the world

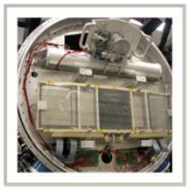
1997 — The first UMTS (3G) demonstrator in the world

2003 — The first 3D TOF camera in the world



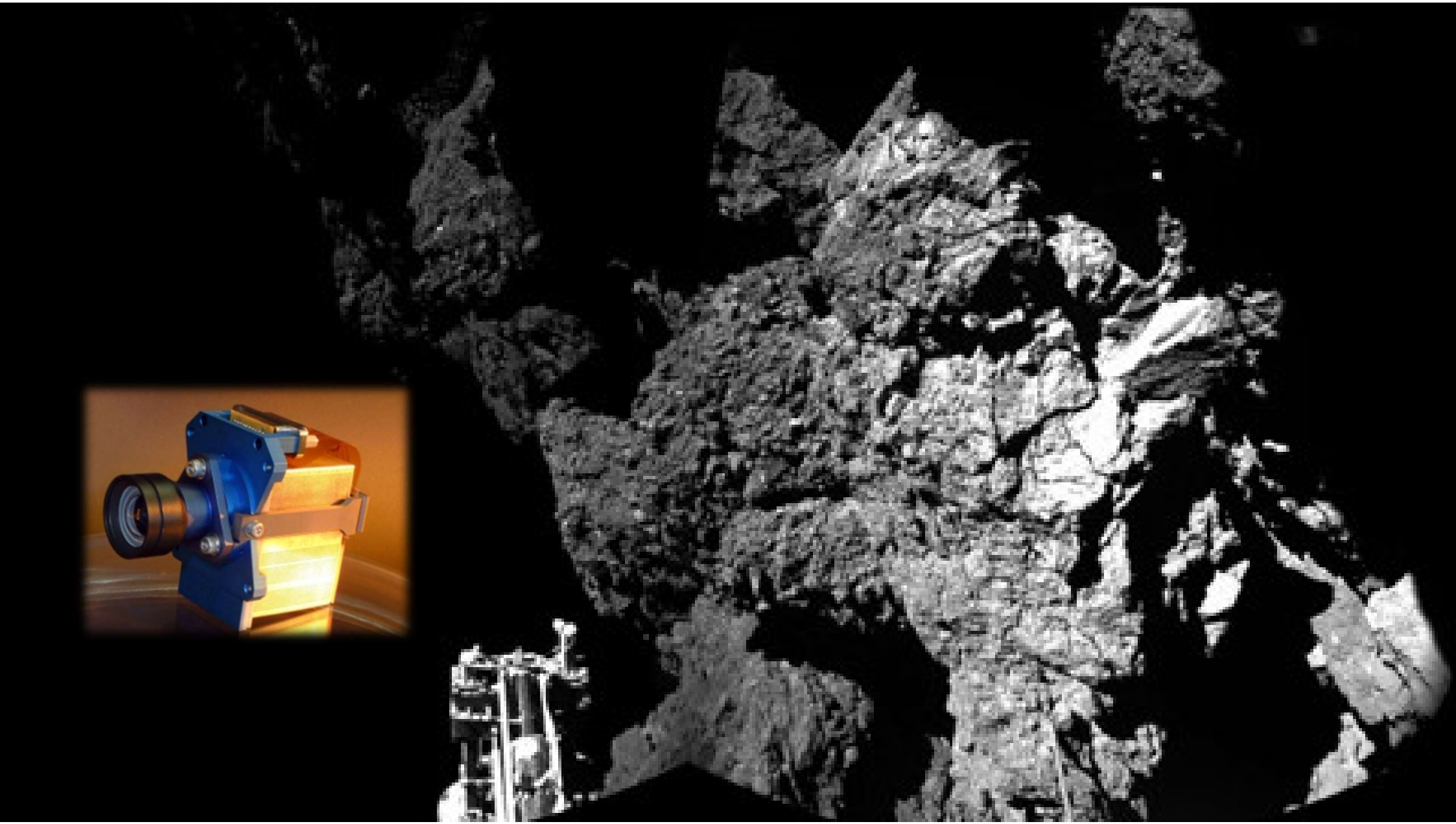
2007 — The first “Invar” out of silicon

2012 — Observation of the oldest galaxy thanks to the reconfigurable slit mask (Mosfire project)



2014 — Colored photovoltaics panels

2016 — *Bloomberg, Feb. 2016* “Mechanical watchmaking just leapt forward after 250 years”

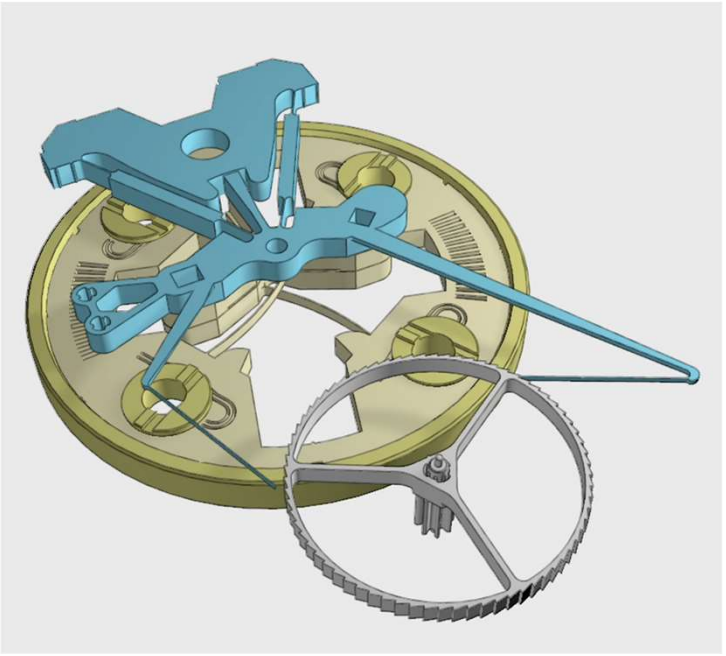


“Will Genequand system disrupt the balance wheel?”

VAUCHER MANUFACTURE FLEURIER
:: csem

Classical regulator

Genequand regulator



HETEROGENEOUS TECHNOLOGY ALLIANCE

CSEM's start-up buy-out

Xemics (*1997*) acquired by Semtech Corp.

CSM Instruments *(1998)* acquired by Anton Paar

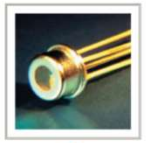
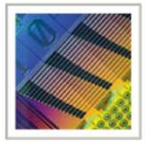
Colibrys *(2001)* acquired by Sagem (Safran)

SNAP Sensor *(2011)* acquired by Analog Devices

ViDi Systems *(2012)* acquired by Cognex

2005 | 2009 | 2013 | 2013 | 2013 | 2014 | 2016 | 2016 | 2017





Neroxis *(2009)* acquired by Veolia Water technologies

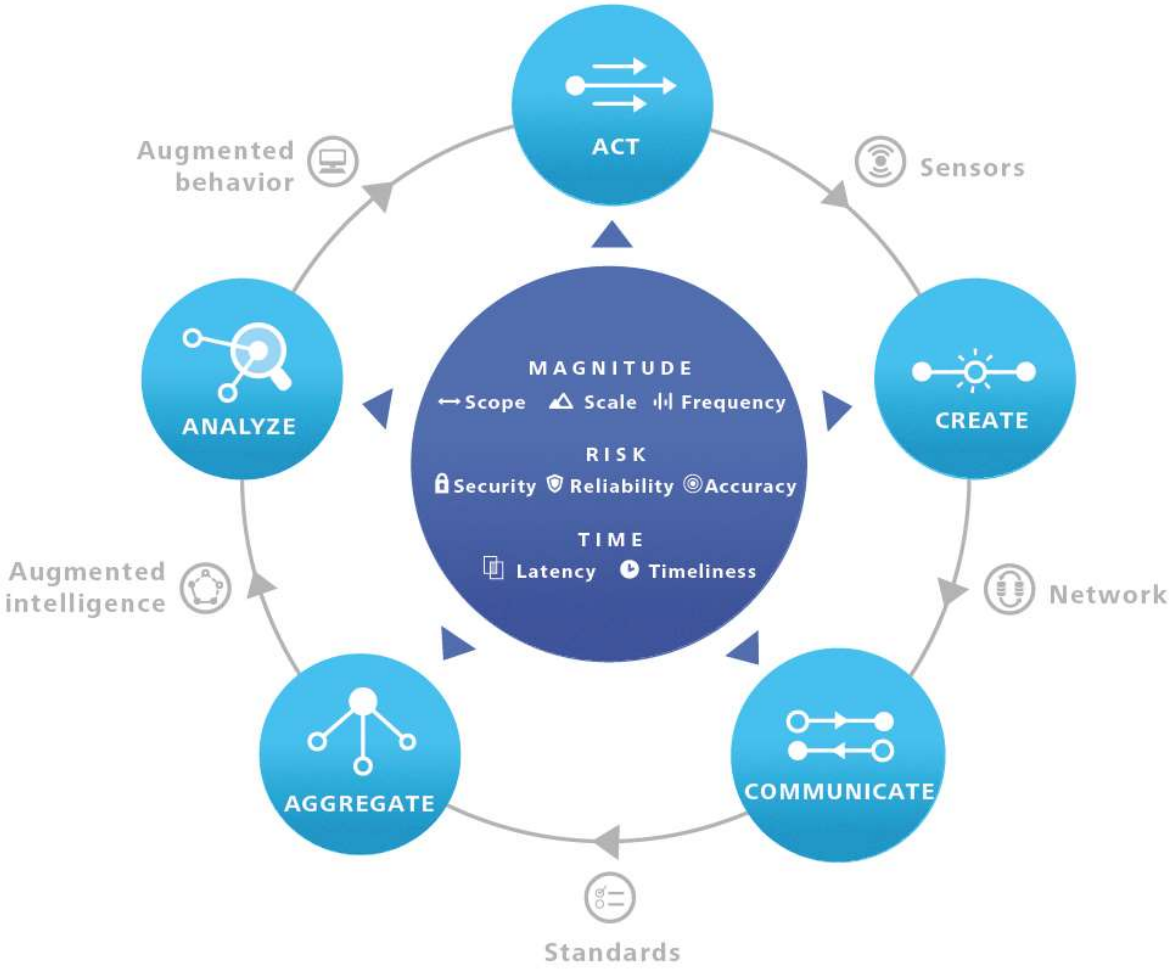
Avalon Photonics *(2000)* acquired by II-VI Inc.

Mesa Imaging *(2006)* acquired by Heptagon

Heptagon *(1993)* acquired by ams

Key requirements for the IoT success

- SENSORS: A device that generates an electronic signal from a physical condition or event
- NETWORKS: A mechanism for communicating an electronic signal
- STANDARDS: Commonly accepted prohibitions or prescriptions for action
- AUGMENTED INTELLIGENCE: Analytical tools that improve the ability to describe, predict, and exploit relationships among phenomena
- AUGMENTED BEHAVIOR: Technologies and techniques that improve compliance with prescribed action



Source: "Inside the Internet of Things (IoT)", Deloitte analysis, October 2015

Smart farming – the future of agriculture

- 9.8 billion people by 2050
- Over 2 billion additional people to feed, a goal only attainable if we increase current food production levels by 70% in the mere 32 years we have ahead of us.

AMBITIOUS?

DataBio – Data-driven Bioeconomy

CHALLENGE

- Raw materials for the bio-economy (food, materials, energy) should be produced efficiently, but in a sustainable and responsible way

SOLUTION

- Acquire massive data about the resources from satellite and aerial images, sensors
- Use Big Data processing on the data - curation, predictive analytics, machine learning, visualization

IMPACT

- Increases productivity, improves decisions and increases investments in bioeconomy
- New opportunities for the European ICT industry

Moloko – Online detection of contaminants in milk

- **Quality control** of milk supply chain by miniaturized, automatized and portable photonic sensor
- **Multiplexing quantitative detection** of up to 10 analytes: food safety parameters (antibiotics , toxins, antifraud analytes) and food quality parameters (casein, lactoferrin)
- **Fast-response on-site monitoring**

And to our everyday life

2001-2002

WEALTHY

MyHeart

2005-2006

BIOTEX
Bio-sensing textile for health management

ProeTEX

2008-2009

HeartCycle

psyche

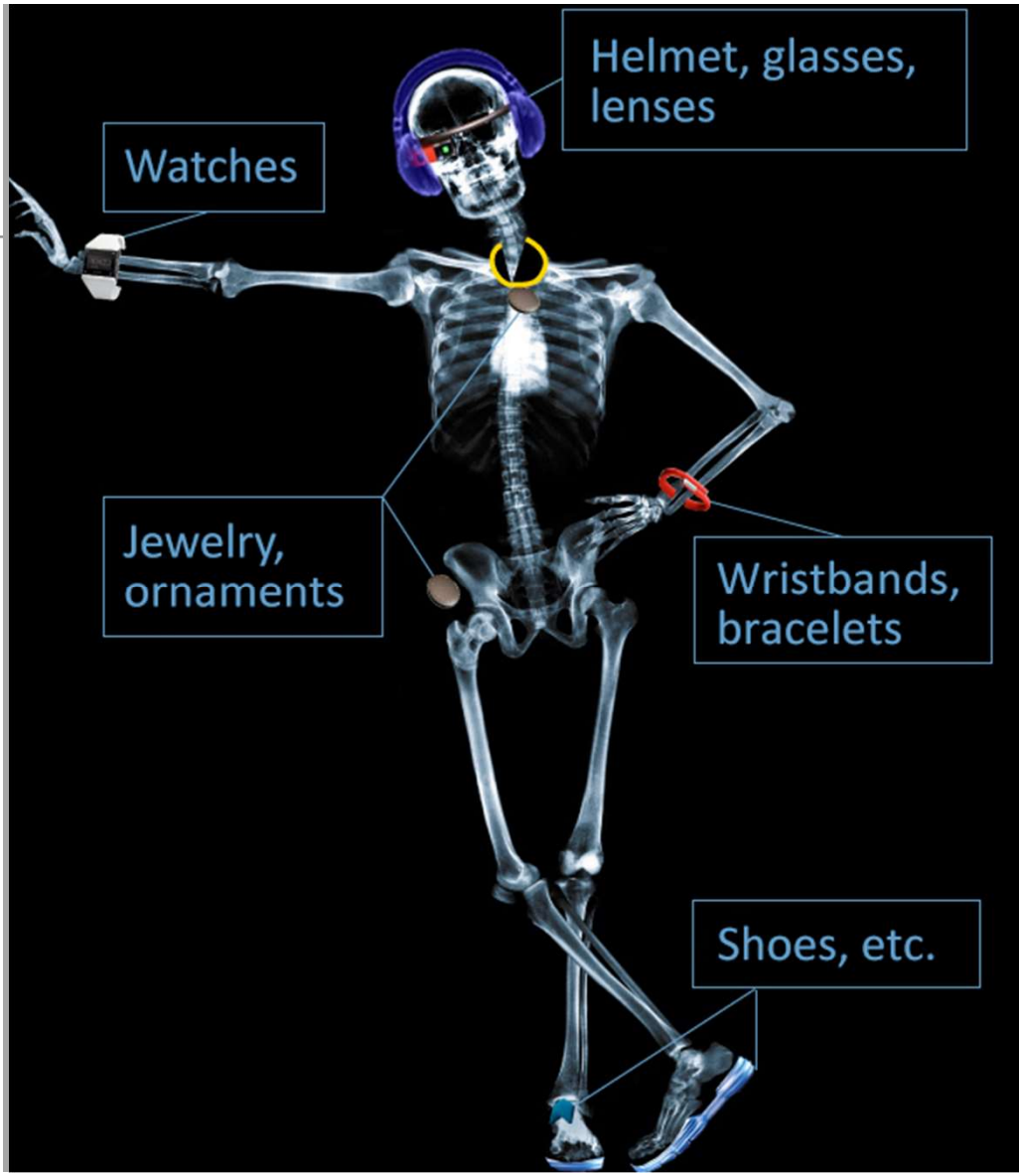
TODAY

E-health & wearables

- Ca
- Blo
- Re
- Hu
- En
- Au
- Nig
- Nc
- …

"That's grandma's wearable technology."

© Cartoonist Wildt, Chris



Framework for portable monitoring devices

Key success factors

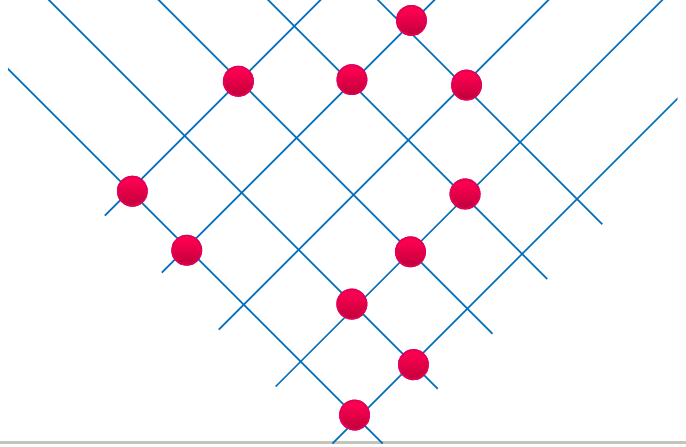
Fashion

Comfort, integration & ease-of-use

Low cost & reliable

Total connectivity

Multifunctional & multi-parameters



Enabling technologies

Sensing & monitoring

Miniaturization

Encapsulation

Low consumption, connectivity & energy scavenging

AI, signal processing & algorithms

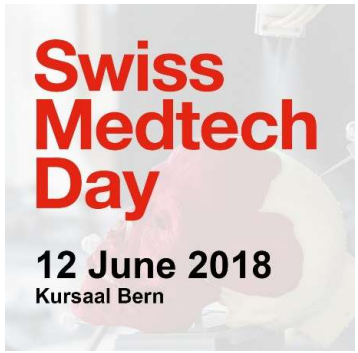
© Cartoonist Cordell, Tim

AVA – the sensor bracelet that tracks female fertility

Health data – Tracks your sleep, physiological stress levels, resting heart, …

A crop of awards & recognitions

- Best startup 2017
- Nominated for the Swiss Medtech Award 2018
- In the top 3 finalists of the Swiss Economic Award 2018



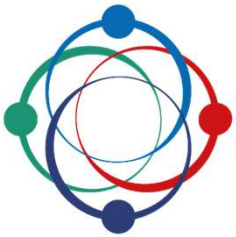
oBPM –non-invasive, continuous blood pressure monitoring

Conclusion

- The three closely interrelated **trends** (manufacturing, digitalization and complexification) dominate in an increasingly **competitive** and **global** industrial environment.

- *CSEM is a Swiss cornerstone of **technology development and transfer** in **micro-engineering** (our DNA) creating **smart systems**, a key pillar of the **digital economy** .*

- By bridging to **domestic and international** Industry CSEM has contributed to several **revolutions** despite its “only” 500 persons. We **COMMIT** to make even better in the future.



HETEROGENEOUS
TECHNOLOGY
ALLIANCE

Thank you!

csem

cea

VTT

www.csem.ch

Fraunhofer
MIKROELEKTRONIK