Final Remarks MAM 2015

Volker Saile

February 3, 2015

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MSM
LE MENSUEL DE L'INDUSTRIE

MAM 2015, 6th Edition

Same Concept, Same Venue, Same Quality


mAm 2010
Micronarc Alpine Meeting
Equipment for microproducts
MICRONARC
MANCEF
20-22 January 2010
Villars-sur-Ollon, Switzerland
SKI

mAm 2010


mAm 2012

mAm 2012


mAm 2013

mAm 2013

mAm 2013

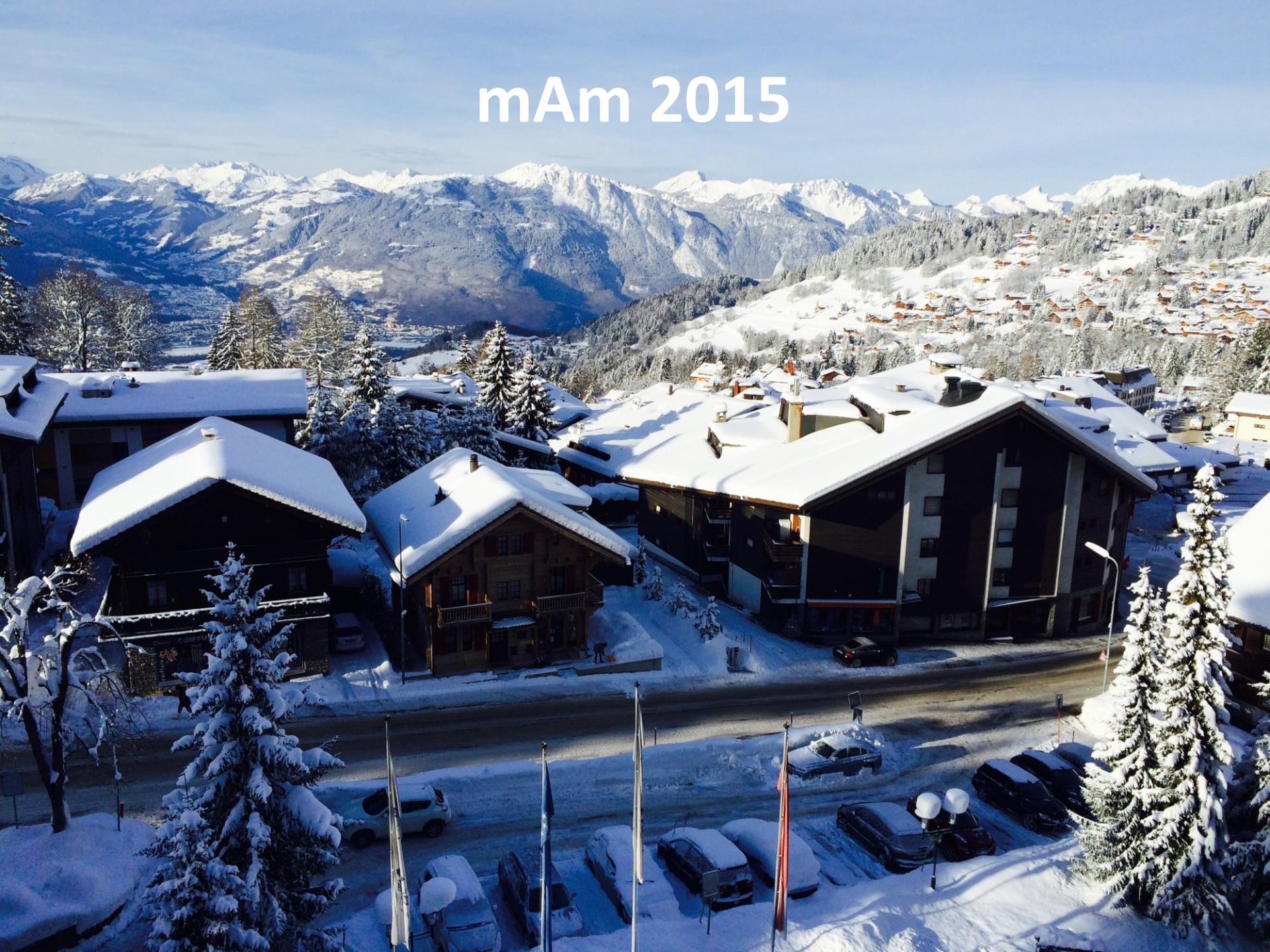

mAm 2014
LA ROSIERE

mAm 2014

mAm 2014

mAm 2015

mAm 2015



The Concept

Background

Microsystems have now entered the age of **high volume production** for consumer applications, especially mobile phones, ICT and medical disposable devices. The issues associated with the production of these are of continued interest to **manufacturers**. These include **tooling in high volume fabrication** of **precision parts,** making highly **efficient and reliable automated assembly lines** and **test systems** for microproducts. There is a **fast growing market** for such components and products.

The Programm

Monday 2 February 2015

09:00-09:30 **Welcome Session**

Danick Bionda, Secretary General, Micronarc

Prof. Dr. Volker Saile, Chief Science Officer, Karlsruhe Institute of Technology, President, **Mancef**

David Tolfree, Vice President – Europe, Mancef

Yvan Dénéréaz, Office for Economic Affairs, Canton of Vaud

Jean-Michel Stauffer, Innovation adviser in Microtechnologies, Innovaud

09:30-10:00 **Invited Keynote on the Future of Micro-manufacturing I**

Chair: Volker Saile, Mancef; KIT

Dr. Kilian Bilger, Director Microsystem Technologies - Corporate Research at Robert Bosch GmbH (DE)

▲ *MEMS: Sensors for the Internet of Things*

R. Bosch Company. New: House appliances – 50% share from SIEMENS. Sma5rt home.
MEMS supplier: automotive, consumer, Akustika, *Bosch connected Devices and Systems.*
Three phases of sensors. The TSensor concept.
Why MEMS? Portfolio for automotive. Car architecture: > 100 sensors per car.
Smart phones: 1.3 bn in 2013 – but there will be saturation. Portfolio for smart phone sensors.
New: Sensor BME680: T, p, humiditiy, CO2 and alcohol. 3x3 mm.
Wearables.
6.5 bn connected to internet. Everywhere sensors – connected – everything will be analyzed.
Connected devices platform.
More than hardware: Standards, ownership of data, business models.
Energy consumption
Sensor node – gas sensing – microphones ….. for IoT.

10:30-12:00 **Micro-manufacturing Applications I – Watchmaking**

Chair: Philippe Fischer, FSRM

Keynote: Prof. Yuri Lopez de Meneses, Production Engineering and Robotics Laboratory, HE-Arc (CH)
▲ *Towards aesthetic quality control in the production line*

Humans … subjectivity, quantification?
Industrial vision.
Approach: Feature extraction and classification, example: intensity and gradient.
Multiple features.
Camera and software.
Dedicated lighting, automated lighting (robot).
Classifiers – separate classes, learning phase.
Implementation.
Other applications: watch acoustic signals.

Dr. Olivier Dubochet, Section Head, Process Development & Small Series Production, CSEM (CH)

▲ *MEMS for Watches*

Mechanical: 1% of world market but 50% of value.

Si: why?

Mechanical properties, amagnetic, corrosion, design freedom, precision, batch, tribology.

Spiral spring – SILINVAR for thermal compensation.

Photolithography and MEMS processes.

Patek Philippe.

Disruptive escapement mechanisms with Si.

High quality factor: watch runs for 1 month rather than for 2 days.

Hybridation: Si + metal (LIGA).

New materials (SiC). Miniature atomic clock.

Stéphane von Gunten, Laboratory and Technology Manager, Ulysse Nardin (CH)
Ulysse Anchor Escapement; innovative horology using silicon technology

Si-technology, Bosch process
Function of mechanical watch.
Properties of Si … watch components
Manufacturer: SIGATEC SA, Sion/CH
Spring, escapement.

Exhibitor elevator pitch (3 min) – IcoFlex

IcoFlex and EPFL.
Microfabrication – Glass and ceramics.
Watch industry, electronics, biomedical.
4-8“ wafers, 500 to 5000 wafers per year per project.

13:30-15:30 **Micro-manufacturing Applications II – Medtech**

Chair: Pierre-André Grandchamp, FSRM

~~**Keynote: Priv. Doz. Dr. Ing. Timo Mappes,** Director Microscopic Imaging, Carl Zeiss AG (DE)~~

~~*Dye lasers for lab-on-a-chip applications: Integration and sensing schemes*~~

Victim of a flu – see you next year

Dr. Harry Heinzelmann, VP, Chief Technology Officer, **CSEM** (CH)

Nano-Probing Biological Matter for Medical Applications

Probing – touching, feeling, smelling
Force microscopy. Nanomechanics.
Cantilever arrays – artificial nose.
Elastic response: tumor cells vs. healthy cells.
Biochemistry and microfabrication.
Cantilever arrays and cell arrays probed by force spectroscopy.
Nanomechanical biosensing. Breath. Teaming up with ARTIDIS for biopsies.
Stiffness of tissue is different for cancer tissue.
Nanoscale dispensing NADIS. Penetrate cell membrane.
Bioindenter. Healthy vs. repaired tissue. CSM Instruments.

Dr. Niels Kramer, Department Head, Technology Laboratories at **Philips Innovation Services**, (NL)

▲ *Living Chips and Chips for the Living*

Changes in healthcare. Flex2Rigid platform: 360° ultrasound transducer. Catheder.
Cardiac toxicity screening – heart muscle cells. MEA chip.
Stretchable membrane with electrodes – beating!
Technologies – materials – certified manufacturing.
„Valley of death" – pilot line for medical devices at Philips.

~~**Björn Peters**~~, Corporate Business Development Officer, **Valtronic** (CH)

▲ *A secure implant and physiological platform*

Björn Peters replaced by MARTIN ZIMMERMANN.
Valtronics: Engineering: 80, Production: 400 - CH, US, Marocco.
Compendium platform: Collect Data, Transmit, Store and Share, Manage and Use.
Device: security, low power, HIPPA compliance.
Biometric controlled reader, APP.
Wireless ECG.

Exhibitor elevator pitch (3 min) – Femto Engineering

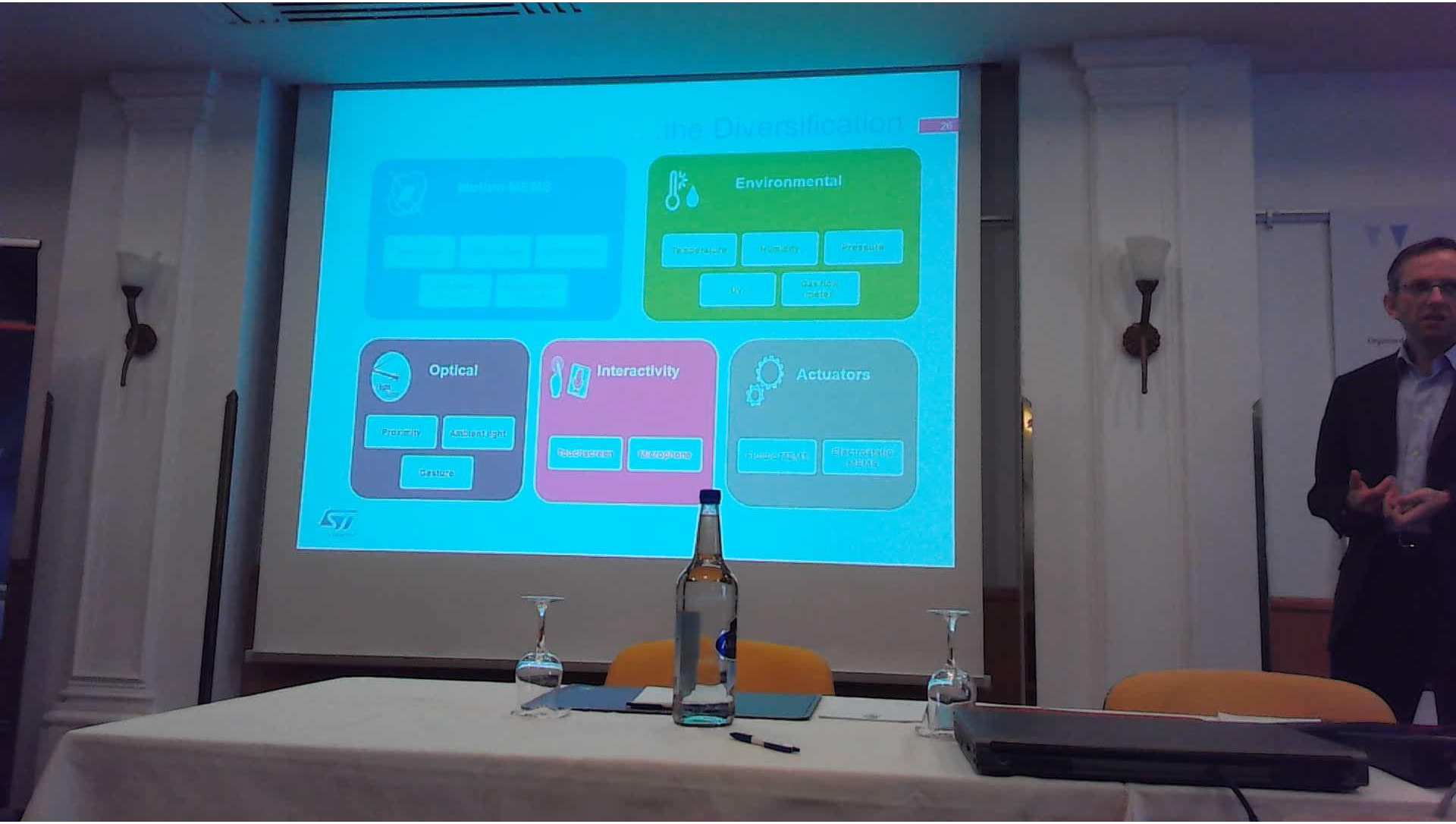
Optics, fluidics, transportation, energy, bio-chip fabrication.

16:00-17:30 **MEMS**

Chair: ~~Sebastian Gautsch, EPFL~~ Erol Harvey, MiniFAB

Keynote: Benedetto Vigna, Executive Vice President, General Manager, Analog, MEMS & Sensors Group, **ST Microelectronics** (IT/CH)
▲ *Beyond Motion MEMS*

ST Micro: 9 bn MEMS last year. First billion-dollar MEMS company.
Beyond motion MEMS!
Start: Nintendo – consumer MEMS 2005.
9-axis MEMS: acceleration, gyro, magneto.
Ultra: low-power, high-perfomance, high-capabilities,…
Sensors and microactuators. Smart.
IoE: Internet of everything (IoX).
Wearables, smart home, smart city, smart car.
Brain – communication – interfaces.
Distribution network – Ecosystem.
Diversification: Motion, environment, optics,


the Diversification
Environmental
Optical
Proximity
Ambient light
Gesture
Interactivity
Actuators

Prof. Dr. Juergen Brugger, Microsystems Laboratory LMIS 1, EPFL (CH)

▲ *Printing and stenciling as advanced MEMS manufacturing methods*

Printing and stenciling: PVD + shadow mask – 75 nm, record 15 nm.
Nanowires and nanodots, magnetic nanostructures.
Blurring effects in stenciling.
Etching through stencils --- photonic nano-antennae.
Inkjet: microlenses.
Combination of stencil and inkjet: micro-mirrors.

Dr. Rafał Walczak, Wrocław University of Technology (PL)

▲ *Lab-on-a-chip based instruments for mobile laboratory for real-time battle-field biological weapon detection*

Military: many threat agents.
Fast, mobile, independent devices.
SFORA project: Collection, isolation/identification, validation.
Mobile platform – laboratory (container) – real time PCR and gel electrophoresis.

Exhibitor elevator pitch (3 min) – Lyncée Tec

Digital holographic microscopy.
Actuators in liquid, microphone (stitching).
Resolution: 1 nm in-plane, 5 pm out-of-plane.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COMS 2015
Kraków, Poland
COMS 2015
KRAKOW | POLAND
20th Conference
on Commercialization of
Micro- Nano Systems
September 2015
Kraków
POLAND
-16.09.2015
6th Micronarc
MICRONARC
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MEMS

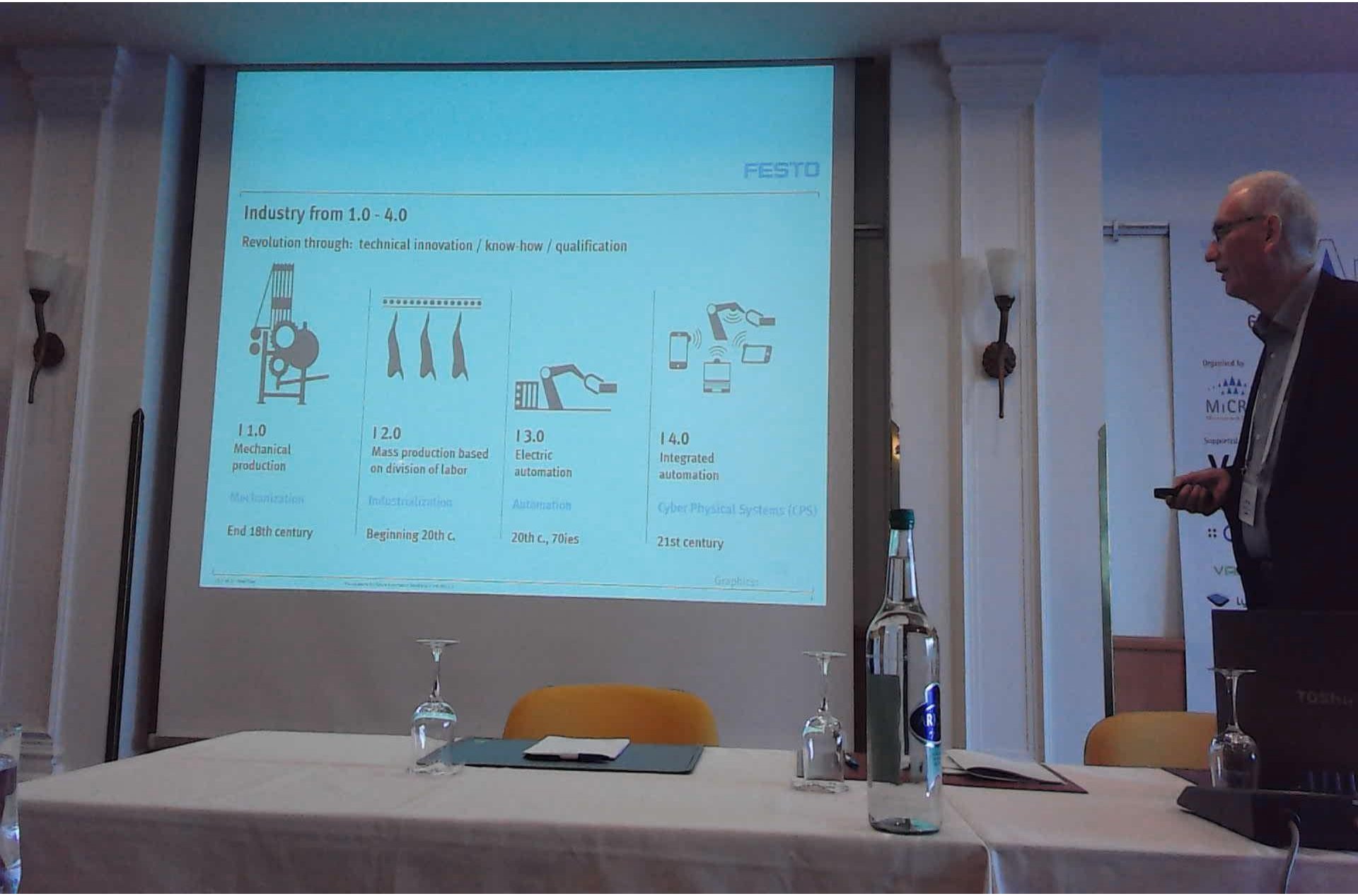
Tuesday 3 February 2015

08:30-10:00 **Assembly and Automation**

Chair: Matthias Krieger, CSEM

Keynote: Prof. Dr. Peter Post, Head of Corporate Research and Technology, FESTO (DE)
Microsystems for Future Automation Solutions in Industry 4.0

Industry 4.0 and microsystems.
German initiative: Factory of the Future.
R&D projects, FESTO Didactic, Learning Factory in new FESTO Technology Plant.
FESTO products: component supplier.
Development of mechatronic systems to CPS.
Product examples.
Miniaturization: Space. Piezo, housing, MID.
Fully automated assembly line.
Strategic fields: Smart and Intuitive.


FESTO
Industry from 1.0 - 4.0
Revolution through: technical innovation / know-how / qualification
I 1.0
Mechanical production
Mechanization
End 18th century
I 2.0
Mass production based on division of labor
Industrialization
Beginning 20th c.
I 3.0
Electric automation
Automation
20th c., 70ies
I 4.0
Integrated automation
Cyber Physical Systems (CPS)
21st century
Graphics

Mélanie Dafflon, R&D Manager, **Asyril SA** (CH)

Flexible feeding system on the way of plug & produce

Feeding and palletizing parts <40 mm.
Vibration – Vision – Robotics.
Feeder with vibration. Custom platform surface. Intelligent vision system.
Robots: delta robots – precision, accuracy.
EU project PASTA for textiles.
PRIME – system integration toolbox.

~~**Prof. Dr. Jan G. Korvink,** Director – **Laboratory for Simulation, IMTEK** (DE)~~

~~*Nanolitre 1H NMR and MRI detectors for chemistry and the life sciences*~~

Victim of a flu – see you next year

Exhibitor elevator pitch (3 min) – Microtec Südwest

Cluster: Region – 360 partners.
Focus: Smart - Health, - Production, - Mobility, - Energy.
Special interest groups.
Microtechnics Alliance.

10:30-12:00 **Novel Manufacturing Technologies I**

Chair: David Tolfree, Mancef

Keynote: Dr. Martin Hermatschweiler, CEO, Nanoscribe (DE)
▲ *3D printing – the new standard for advanced microfabrication*

3D-printing, also maskless lithography. UV- resist and NIR laser.
Between e-beam and direct laser writing.
38 employees, 8 open positions. Systems manufacturer.
Dielectrics and metals.
Examples: Photonics, optical waveguides, mechanical structures, bio-templates,…

Dr. Felix Holzner, CEO & co-founder, Swisslitho (CH)
▲ *Rapid prototyping of high quality micro- & nanostructures using thermal scanning probes*

11 people from 10 countries. Hot AFM tip for local evaporation of polymer.
Fast, pattern and inspect, 3D, pattern transfer. PPA resist.
Ideal for rapid prototyping: 20 mm/s, 8 nm.
„We are good in making non-useful things“.
Optical micro cavities, archival data storage, pattern transfer with RIE, graphene patterning.
Comparison with e-beam.

Dr. Andrea Lovera, CTO, **FEMTOprint** (CH)
▲ *FEMTOPRINT® - enabling innovation with multi feature 3D micro devices out of glass*

3D-printing. Subtractive manufacturing. Laser exposure, etching.
Non-linear absorption, 1 µm resolution, aspect ratio >> 1:50, Ra = 10 nm after polishing.
Movements of watches, glass hinges, actuators, microfluidic chips,
3D catheder tips, lenses, waveguides, gratings, moulds.

Exhibitor elevator pitch (3 min) – KNMF
Exhibitor elevator pitch (3 min) – Höganäs

KNMF: Free access for research (publications), 50 experts, proposal procedure.

Höganäs: Big company – powders. Here powder-glue-powder-glue… stacks for 3D Structures. Processing at room temperature!

13:30-15:00 **Novel Manufacturing Technologies II**

Chair: Danick Bionda, Micronarc

Keynote: Dr. Erol Harvey, CEO, MiniFAB (AU)

▲ *Old is the new New : Update on manufacturing techniques for polymer micro devices*

Teardrop analyzer.
Bionic eye.
Volume requirements per stage. The transition from design to manufacturing.
Australian economy 2004 – 2014 and the comparison to the rest of the world.
Productivity – selection criteria – processes – ranking.
Validation of processes.
Direct machining, injection moulding, sputtering.
Robotics and automation.
Visual inspection vs. automated QC.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Dr. Alexander Colsmann, Head of Organic Photovoltaics Group, KIT (DE)
▲ *Fabrication of Organic Solar Cells from Eco-friendly Solvents*

OPV-modules – applications. Printing!
Layers of organic PV; bulk heterojunctions.
Efficiencies … tandem solar cells.
Vision vs. reality.
Flexibility, environm. friendly solvents, printing.
Concepts are applicable to OLEDs.

Olivier Theytaz, Engineering Director at Logitech (USA / CH)
▲ *From lab to fab: taking lab innovation to mass production*

Tracking on glass? … Darkfield.
Glass is always dirty.
Size and cost reduction. Nano-receiver with plug and forget. Pico-receiver 3mm.
2D sensor.
Mice: 9 batteries/year to now 0.5 batteries per year.
MEMS in mouse for gaming: 2D sensor + gyro + acceleration). FAST!

Exhibitor elevator pitch (3 min) – EXPRESS

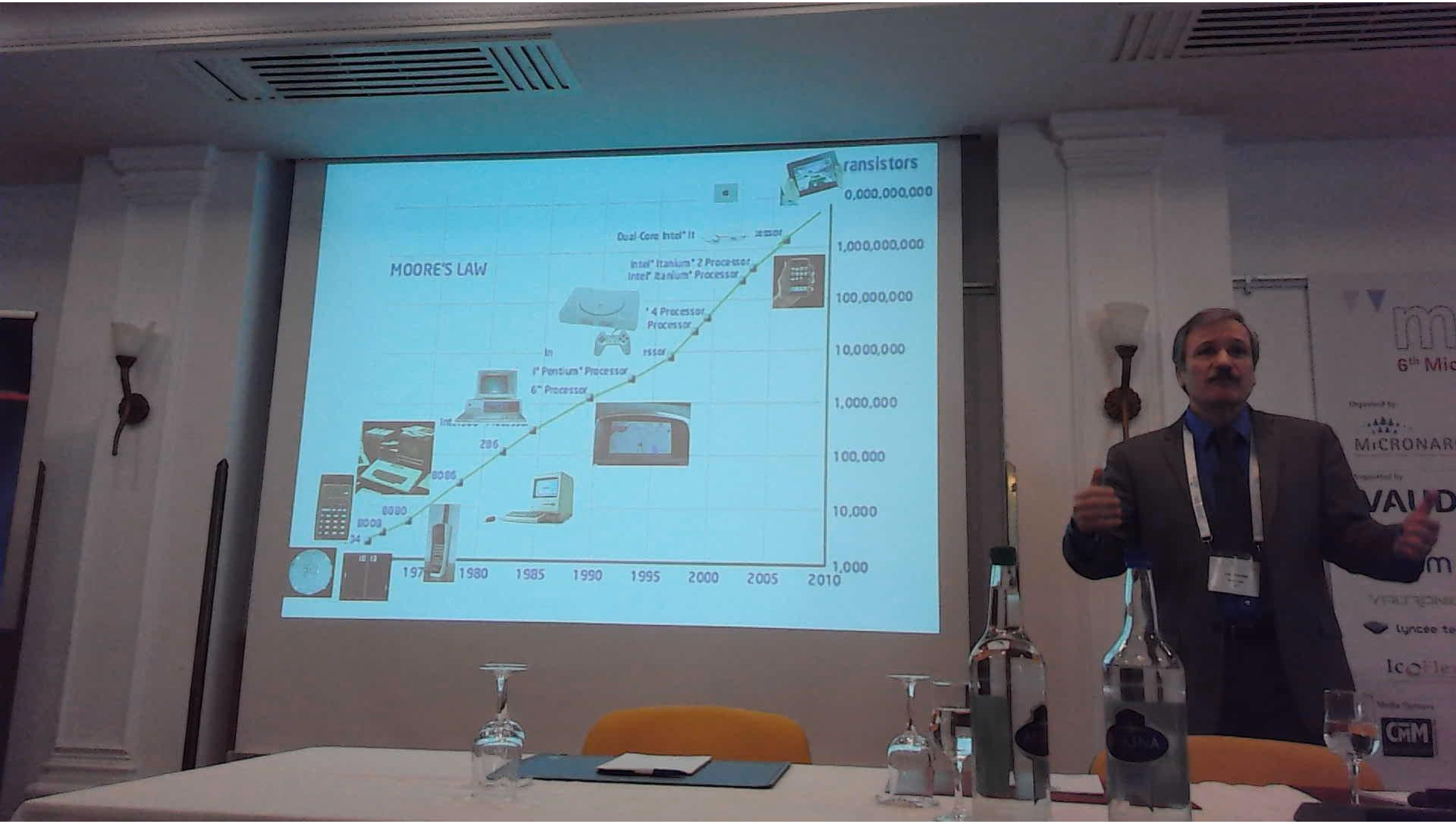
FP7: Smart system integration in Europe. Gain global leadership. Ecosystem.

15:30-16:15 **Invited Keynote on the Future of Micro-manufacturing II**

Chair: Volker Saile, Mancef; KIT

Dr. John Randall, President, **Zyvex Labs** (USA)
▲ *Atomically Precise Manufacturing: The path to digital fabrication and an Inverse Moore's Law*

Feynman. Technical progress in the US 1910 to 2010.
Micro manufacturing, micro electronics, Moore‘s law for downsizing.
Rel. precision for IC is 5% - terrible but digital electronics is tolerant.
Atomic precision = 0.3 nm. Analog fabrication but atoms are quantized.
Go for digital manufacturing: Atom-by-atom manufacturing.
Precision +- 1 atom, no error accumulation.
New exponential trend: larger volumes! Moore – down, here – up.
Scaling up and maintaining absolute precision.
Feynman 1959 – STM 1986 – IBM logo 1989.
DNA origami.
ZYVEX: CNT for boats, nanoprobes, atomic precise manufacturing.
Si, Si+H,… Litho results: 3 nm squares.
ZYVEX control systems are sold as products.
Applications: Standards, DNA sequencing, dopant atoms in Si, qbit devices, quantum comp.
Hards masks: 10 nm lines and spaces. Nanoimprint templates.
Smart MEMS scanner.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Intel® Itanium® 2 Processor
Intel® Itanium® Processor
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Processor
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6® Processor
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16:15-16:30 **Final Remarks**

Prof. Dr. Volker Saile, Chief Science Officer, Karlsruhe Institute of Technology (Germany), President, **Mancef**

Danick Bionda, Secretary General, Micronarc

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Organising Committee

- **Edward Byrne** – Micronarc; Project Manager FSRM
- **Prof. Dr. Volker Saile** – Chief Science Officer, Karlsruhe Institute of Technology; President, Mancef
- **David Tolfree** – Vice President Africa/Europe, Mancef
- **Danick Bionda**, Secretary General, Micronarc
- **Philippe Fischer** – Director, FSRM (Swiss Foundation for Research in Microtechnology); General Advisory Board Mancef Africa/Europe
- **Dr. Sikha Ray** – International Affairs Coordinator, Karlsruhe Institute of Technology / Mancef European Office
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Commercialization of Micro Nano Systems Conference

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Kraków | POLAND 13-16 September

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VILLAR-SUR-OLLON

JANUARY 31 – FEBRUARY 2, 2016


OF SWITZERLAND
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The Threat of Microfabrication