

EPFL MICRONANOFABRICATION ANNUAL REVIEW MEETING

2013 : TUESDAY MAY 14TH



EPFL MICRONANOFABRICATION ANNUAL REVIEW MEETING

2013 : TUESDAY MAY 14TH

WELCOME & THANKS

- ✘ Welcome to the 13th edition of the CMi MicroNanoFabrication Annual Review Meeting
- ✘ Many thanks for your participation
- ✘ 422 participants (23% industry, 35% external)

SOME HIGHLIGHTS IN 2012

✘ CMi Users publish in high impact journals ✓

LETTER

doi:10.1038/nature10787

Quantum-coherent coupling of a mechanical oscillator to an optical cavity mode

E. Verhagen^{1*}, S. Deléglise^{1*}, S. Weis^{1,2*}, A. Schliesser^{1,2*} & T. J. Kippenberg^{1,2}

REVIEW

doi:10.1038/nature10679

Tunnel field-effect transistors as energy-efficient electronic switches

Adrian M. Ionescu¹ & Heike Riel²



✘ CMi Users generate successful startups ✓



La start-up lausannoise Biocartis décroche un financement de près de 90 millions



Abionic lève 2 millions de francs de financement

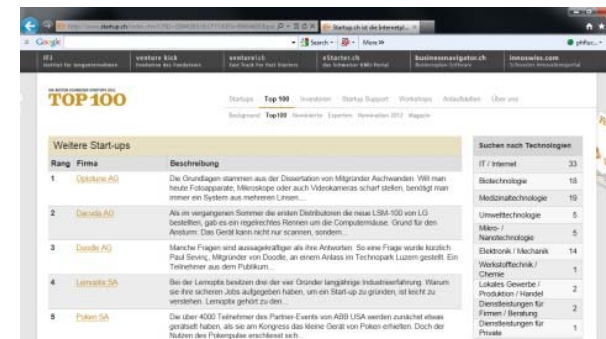
> Test Dépister les allergies en vingt minutes



PARKINSON Vendredi 26 août 2011
La start-up Aleva lève 10 millions
 > Chloé Bloch
Les essais cliniques vont démarrer
 La société lausannoise Aleva Neurotherapeutics a développé un implant miniature destiné à être introduit dans le cerveau. Il permet de bloquer par stimulation électrique les signaux qui engendrent les symptômes de la maladie de Parkinson.



ALEVA NEUROTHERAPEUTICS: levée de 4 millions
 Aleva Neurotherapeutics a terminé son tour de financement de série B à hauteur de 4 millions de francs. L'investisseur clé de cette spin-off de l'EPFL, spécialisée dans la stimulation profonde (Deep Brain Stimulation, DBS) pour les indications neurologiques sur la maladie de Parkinson ou les dépressions, est Banex Ventures Partners.



Lemoptix SA ranked N° 4 in the top100
 Source: <http://www.startup.ch/>

SOME HIGHLIGHTS IN 2012

✘ CMi Users proceed to technology transfers ✓

News MEMS Around the Body 30

Disposable Insulin Pump

MEMS Pressure Sensors on Flexible Plastic Substrate close to Eyes for Glaucoma Detection

24-hour disposable contact lens with pressure sensor – ST and Sensimed

Source: Deblotech, www.jewelpump.com

Source : STMicroelectronics

MEMS Executive Congress Europe
Zürich, March 20th, 2012
Carmelo Papa, Senior Executive VP

The 18th World Micromachine Summit
Hsinchu, Taiwan, April 23-26, 2012
Adriano Basile, Senior Application Eng.

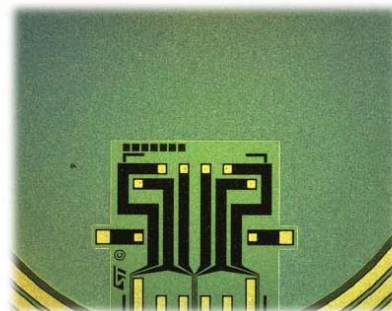
SOME HIGHLIGHTS IN 2012

✘ CMi Users proceed to technology transfer ✓

Pressure Sensors on Flexible Substrate close to Eyes for Glaucoma Detection

31

24-hour disposable contact lens with pressure sensor ST and Sensimed



Sensors on Plastic Substrates

Source : STMicroelectronics

MEMS Executive Congress Europe
Zürich, March 20th, 2012
Carmelo Papa, Senior Executive VP

The 18th World Micromachine Summit
Hsinchu, Taiwan, April 23-26, 2012
Adriano Basile, Senior Application Eng.

SOME HIGHLIGHTS IN 2012

✕ CMi Users proceed to technology transfer ✓

Miniature 8" Wafer Disposable Insulin Pump

32



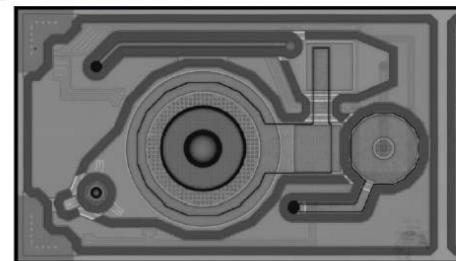
Small

- Size: 6 mm x 10 mm
- Flow range: up to 5 ml/h
- Stroke Volume: 200 nl, 0.02 U



Source: Debiotech

- **Precise**
 - Nominal Accuracy $\pm 5\%$
 - Reproducibility $\pm 2\%$
- **Safe**
 - Built-In failure detection
 - Anti Free-flow features



Source : STMicroelectronics

MEMS Executive Congress Europe
Zürich, March 20th, 2012
Carmelo Papa, Senior Executive VP

The 18th World Micromachine Summit
Hsinchu, Taiwan, April 23-26, 2012
Adriano Basile, Senior Application Eng.

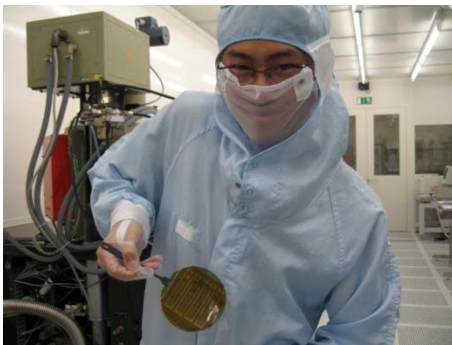
SOME HIGHLIGHTS IN 2012

✘ CMi Users are very active in teaching ✓

- + Pilot project led by Prof. Stéphanie Lacour
- + Interdisciplinary semester project
- + Lab in Tube
- + Competition between teams
- + Teams composed of 3 students from 3 different master programs
- + Design, manufacture, and integrate sensors in millimeter tubes

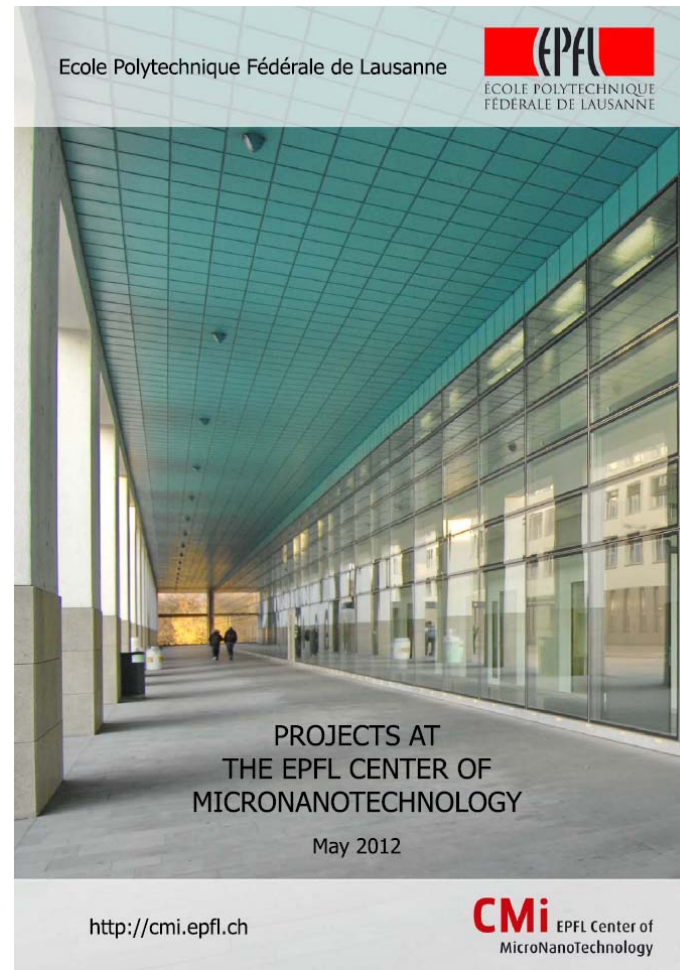
Actually 5 teaching programs in CMi:

- ✘ 1° Gijs/Brugger (1999)
- ✘ 2° Renaud (1999)
- ✘ 3° Muralt (1999)
- ✘ 4° Radenovic/Guiducci (2011)
- ✘ 5° Lacour (2012)



ABSTRACTS IN 2012

✖ 206 abstracts
+13%



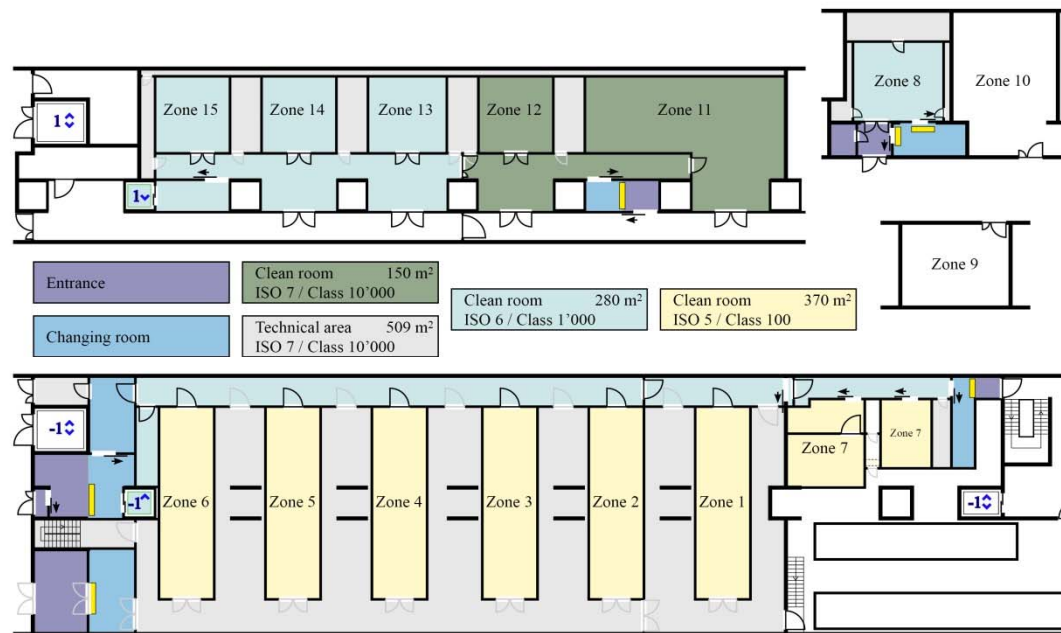
USERS IN 2011

STI	SB	SV	EXT	COMPANIES		
STI-CMi	STI-IMT-LMTS	SB-CIME	SV-GHI-UPKIN	CNRS-LISE	Abionic	Sensimed
STI-CBT-LBO	STI-IMT-LO	SB-ICMP-LASPE	SV-IBI-LDCS	CSEM	Aleva	Sercalo
STI-IBI-LBNI	STI-IMT-LOB	SB-ICMP-LOEQ	SV-IBI1-LMBM1	FEMTO-DMA	Asulab	Sigatec
STI-IBI-LHTC	STI-IMT-LPM	SB-ICMP-LPMC	SV-IBI1-UPDEPLA	POLYMTL	Axetris	SilMach
STI-IBI2-CLSE1	STI-IMT-LPMAT	SB-ICMP-LPN	SV-IBI1-UPLUT	UNIBE	Biocartis	
STI-IBI2-LBEN	STI-IMT-LSBI	SB-ICMP-LPQM1		UNIGE-DBM	Bruker	
STI-IBI2-LBNC	STI-IMT-LSRO1	SB-ICMP-LQM	ENAC-IA-LIV	UNIGE-DPMC	Burkert	
STI-GR-SCI	STI-IMT-NAM	SB-IPSB-LCB	ENAC-IIE-DISAL		Debiotech	
STI-IEL-LANES	STI-IMT-OPT	SB-IPSB-LPMV			Flowdit	
STI-IEL-LSM	STI-IMT-SAMLAB	SB-ISIC-LEPA	IC-ISIM-LSI1		Karmic	
STI-IEL-NANOLAB	STI-IMX-LC	SB-ISIC-LPI			Leister	
STI-IMT-ESPLAB	STI-IMX-LMM				Lemoptix	
STI-IMT-LAPD	STI-IMX-LMSC				MCH-processing	
STI-IMT-LIS	STI-IMX-LP				Microsens	
STI-IMT-LMIS1	STI-IMX-LTP				Novagan	
STI-IMT-LMIS2	STI-IMX-SUNMIL				Qwane	
STI-IMT-LMIS4					Rolex	
196 (33)		43 (11)	23 (8)	16(7)	30 (22)	

- ✘ Total: 308 users (278 academic users + 30 industrial users) +8%
- ✘ Total: 59 laboratories from EPFL +22%
- ✘ Annual growth expected for the next 5 years +10%

CLEANROOM EXTENSION

✗ CMi BM+1



CMi BM+1 mainly dedicated to:

- ✗ Metrology
- ✗ Wet Chemistry
- ✗ Photolithography
- ✗ PDMS processing
- ✗ Thin films
- ✗ Backend activities
- ✗ Exploratory processes

✗ CMi BM-1

Total Surface	NEW surface
1300m ²	300m ²

- ✗ CMi BM+1 is very instrumental in developing new fields of activities

TOOLS INSTALLED IN 2011

✕ SEM

+ Zeiss Merlin

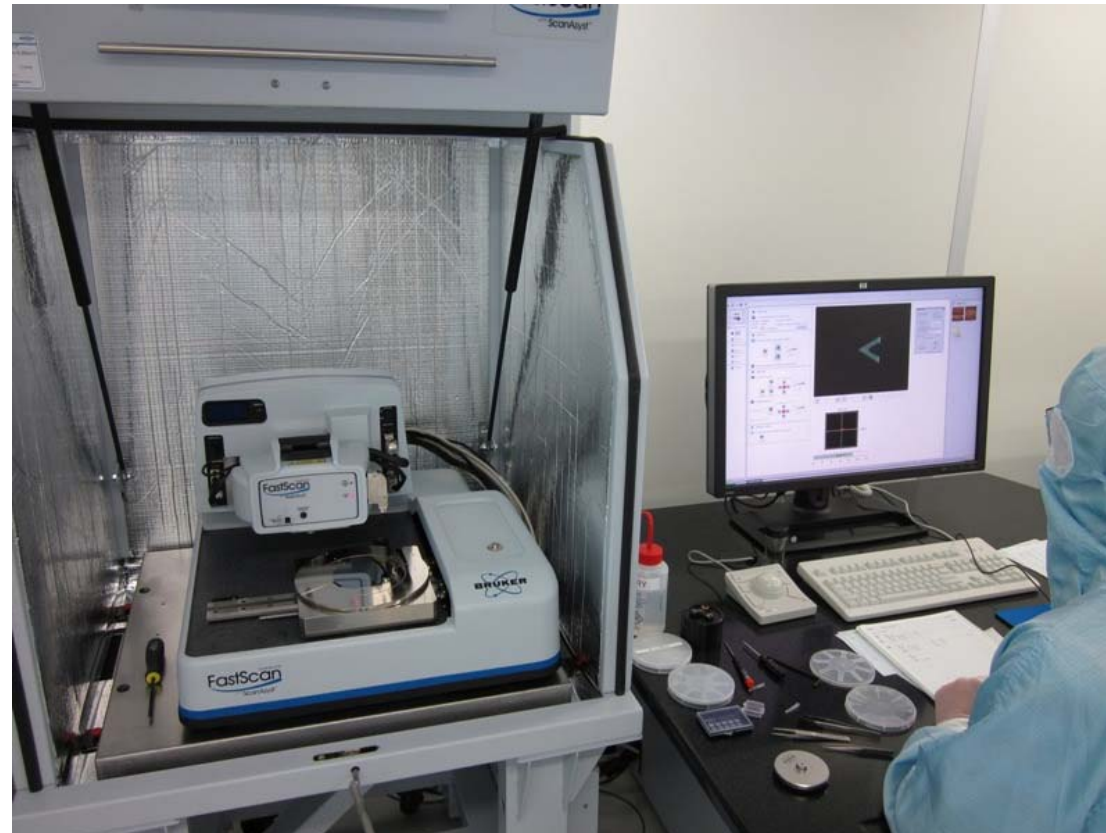


✕ Delivered on 15.11.2011 and accepted on 17.04.2012

TOOLS INSTALLED IN 2011

✕ AFM

- + Bruker Dimension Icon FastScan

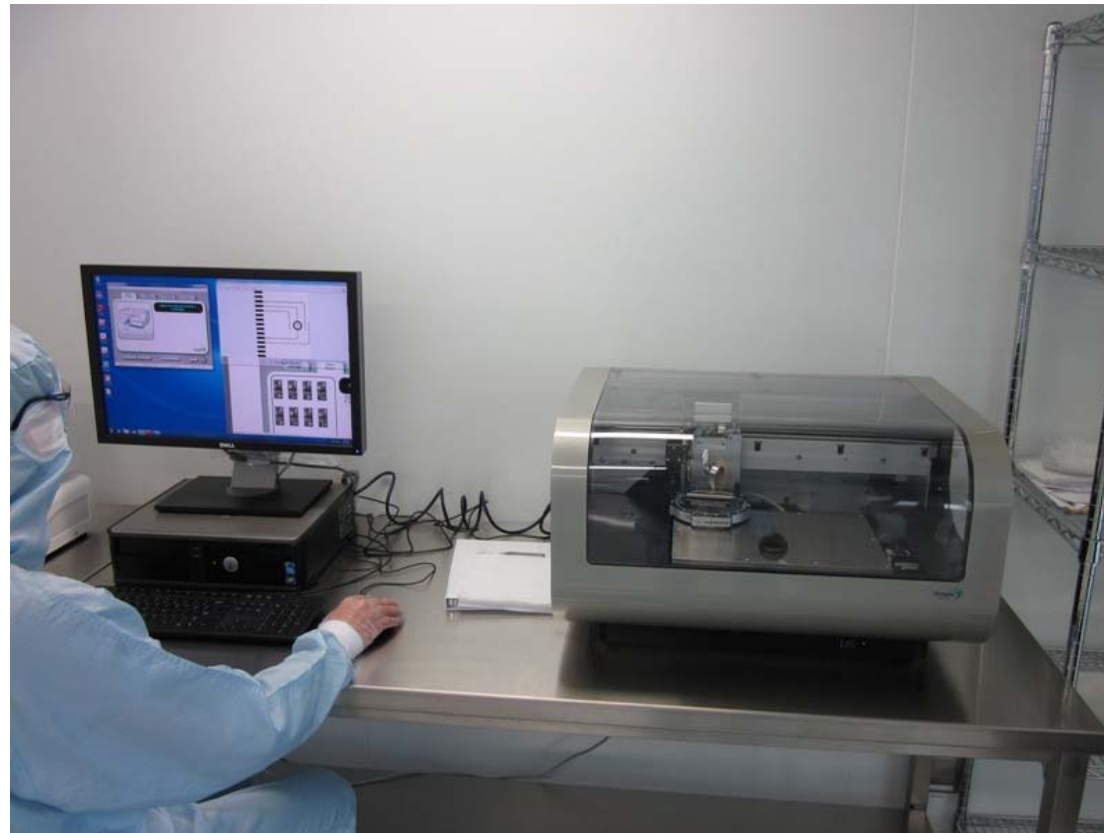


- ✕ Accepted on 10.11.2011

TOOLS INSTALLED IN 2011

✕ Material Printer

+ Dimatix DMP 2831



✕ Delivered on 26.07.2011

TOOLS INSTALLED IN 2011

+ Polyimide oven



+ Surface profiler



+ Photosensitive PDMS Spinner & hood



+ Thickness measurement system



+ SU-8 coater & hotplate



+ μ scope



+ Atmospheric plasma



+ Washer



TOOL TO BE DELIVERED IN 2012

✕ SPUTTER

- + Alliance Concept DP650
- + 6 x 100mm sources
- + Load lock



- + Ti
- + Pt
- + Cr
- + Au
- + Al
- + Cu
- + W
- + Mo
- + TiN
- + TiO₂
- + Al/Si 1%
- + W/Ti 10%
- + ...

- ✕ To be delivered in July 2012

REQUESTED BUDGET FOR 2012

- ✘ Dielectric etcher (tender published 03.11.2011)
- ✘ Ion beam etcher (new)
- ✘ Thin film evaporator (capacity)
- ✘ Mask aligner (replacement)
- ✘ Rapid thermal processor (new)
- ✘ Stress measurement system (replacement)

CONCLUSIONS

- ✘ Since its opening in 1999, CMi has constantly increased its volume of activity
- ✘ The base of Users is spread among the whole EPFL (STI/SB/SV/ENAC/IC)
- ✘ CMi is a unique place for teaching, research, startups, technology transfer and industry
- ✘ CMi is permanently anticipating the future needs for Research & Education
- ✘ Many success stories are built inside CMi

PROGRAM

- × 10h15-10h35 *J. McKinney* (<http://mckinney-lab.epfl.ch>), Microfabricated Tools for Single-Cell Microbiology
- × 10h35-10h55 *C. Guiducci* (<http://clse.epfl.ch/>), Micromachining Technologies for Life Science Applications. Recent Achievements in CMI
- × 10h55-11h15 *M. von Waldkirch* (<http://www.sensirion.com/>), CMOS Meets Sensor: Continuous Innovation for Commercial Sensors
- × 11h15-11h45 Break
- × 11h45-12h00 *H. Urey* (<http://home.ku.edu.tr/~hurey/>), Optical MEMS Sensors and Actuators Using SOI Process
- × 12h00-12h15 *G. Fantner* (<http://lbni.epfl.ch/>), High Speed Atomic Force Microscopy through Microfabrication of Advanced AFM Cantilevers
- × 12h15-12h30 *A. Mapelli* (<http://cern.ch/>), Improvement of Particle Detectors Design through Microfabrication
- × 12h30-14h00 Lunch & Poster Session
- × 14h00-14h15 *O. Martin* (<http://nam.epfl.ch/>), Antennas, Flowers and Bridges: Plasmonic Nanostructures to Control Light at the Nanoscale
- × 14h15-14h30 *J. Dobrzynska* (<http://lmis2.epfl.ch/>), Towards Artificial Skin: Flexible 3-axis Force Sensor
- × 14h30-14h45 *N. Vico Triviño* (<http://laspe.epfl.ch/>), 2D GaN Photonic Crystals
- × 14h45-15h15 Break
- × 15h15-15h30 *F. Cortes Salazar* (<http://lepa.epfl.ch/>), Microfabrication Techniques in Analytical Chemistry: Current and Future Strategies
- × 15h30-15h45 *D. Solignac* (<http://www.icoflex.com/>), Glass Microfabrication for MEMS and Watch Applications
- × 15h45-17h00 Cocktails & Poster Session

ENJOY THE CONFERENCE

- ✘ Cleanroom tours are available today
 - + Registration still possible during the breaks
- ✘ WiFi Access
 - + See last page of the Participants' List
 - ✘ Username: x-cmi2012
 - ✘ Password: saxgas42
 - ✘ Type d'accès: enclair (SSID public-epfl)
- ✘ Save the date: Tuesday May 14th, 2013
- ✘ Enjoy the conference!

THANKS FOR YOUR ATTENTION

