EPFL
CMi

# EPFL CMi - Center of MicroNanoTechnology

Philippe Flückiger

3 May 2022

École
polytechnique
fédérale
de Lausanne

EPFL CMi


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EPFL
CMi

# EPFL MicroNanoFabrication Annual Review Meeting

Philippe Flückiger, EPFL, May 3rd, 2022

Next editions :

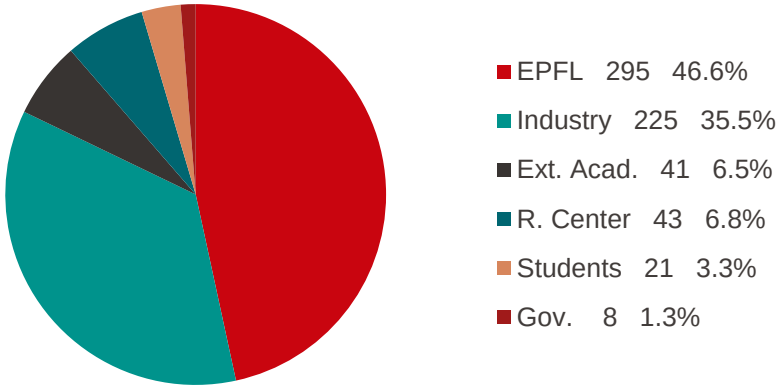
02.05.2023 - 22nd edition
14.05.2024 - 23rd edition
12.05.2025 - 24th edition

# Welcome & thanks

Philippe Flückiger 03.05.2022

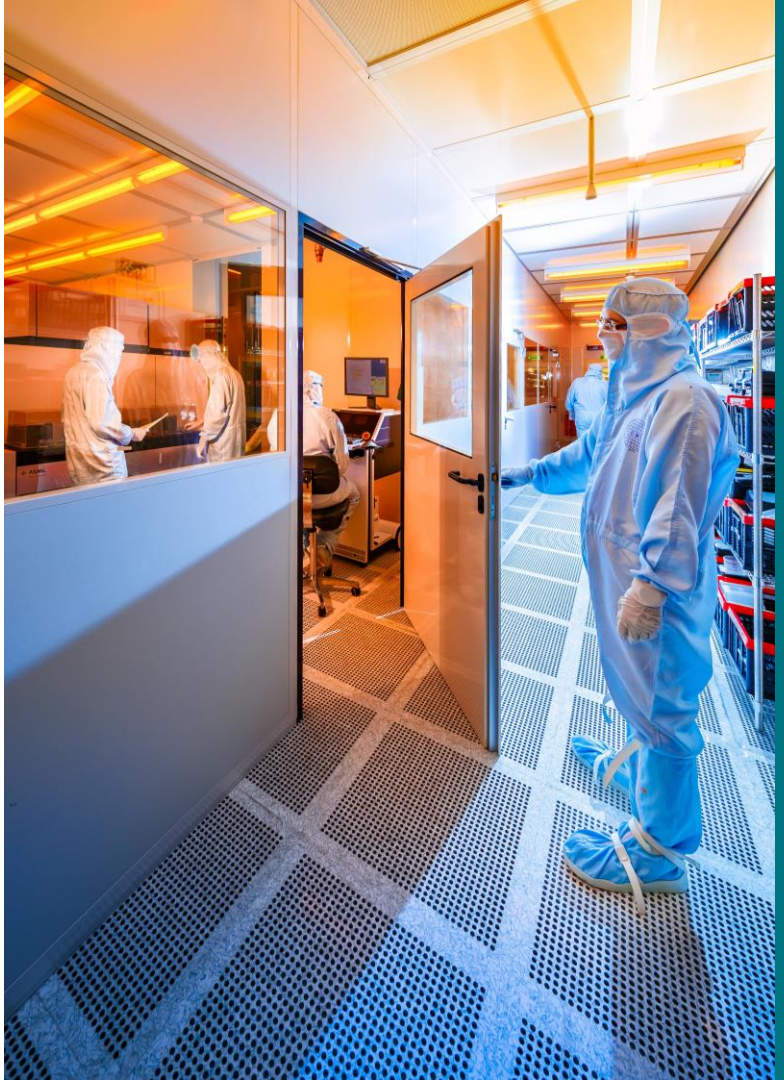
- Welcome to the 21st edition of the CMi MicroNanoFabrication Annual Review Meeting
- 700 participants registered (with 1/3 from industry, more than 50% from outside EPFL)
- Many thanks for your participation

- Global companies
- Local industry
- Startups
- Suppliers
- Government Agencies
- Researchers
- Faculty members
- Students
- Colleagues from other academic cleanrooms




- -> Traveling from 11 different countries
- -> Networking

The list of participants is available on : https://cmi.epfl.ch



# CMi at glance

Users
Finances
Governance
Staff
Tools
Cleanroom
Projects

# Users in 2021

| Engineering Sc. | | Basic Sc. | Life Sc. | Ext. Acad. | | Companies | |
|---|---|---|---|---|---|---|---|
| STI-IBI-BIOS | STI-IEM-NAM | SB-IPHYS-GR-GA | SV-GHI-UPKIN | AMI_FR_BioPhysics | Fiotec_Brasil | ActLight | Lumiphase |
| STI-IBI-CLSE | STI-IEM-NANOLAB | SB-IPHYS-HQC | SV-GHI-UPPERSAT | CERN_2 | Fundep_Brasil | Adept_Neuro | Lunaphore |
| STI-IBI-LBEN | STI-IEM-POWERLAB | SB-IPHYS-LASPE | SV-IBI-UPDEPLA | CERN_EP_dept | INRS_Varennes_CA | Advanced_Fiber_Re | Mackinac |
| STI-IBI-LBMM | STI-IEM-PV-LAB | SB-IPHYS-LBEM | SV-IBI-UPLUT | CHUV | Niels_Bohr_Inst_D | Aleva | MCH-processing |
| STI-IBI-LBNC | STI-IGM-EMSI | SB-IPHYS-LEB | SV-IBI-UPSUTER | CSEM_E1 | UCLouvain | Alpes_Lasers | Mistic |
| STI-IBI-LBNI | STI-IGM-LNET | SB-IPHYS-LMSC2 | SV-ISREC-UPGON | CSEM_T1 | UNI-SUSSEX-PH-IQT | AMS_Intl_AG | Morphotonix |
| STI-IBI-LHTC | STI-IGM-LRESE | SB-IPHYS-LPBS | | CSEM-Muttenz | | Annaida | Nanoga |
| STI-IBI-LNE | STI-IGM-MICROBS | SB-IPHYS-LPQM1 | | EMPA_Dubendorf | | Asulab | Nanoworld |
| STI-IEM-AQUA | STI-IGM-NEMS | SB-IPHYS-LQM | | ETHZ_D-ITET_IEF | | Axetris | Neroxis |
| STI-IEM-GALATEA | STI-IMX-FIMAP | SB-IPHYS-LQP | | ETHZ_D-ITET_Neuro | | Bloesch | Novagan |
| STI-IEM-GR-QUA | STI-IMX-INE | SB-IPHYS-LUMES | ENAC-IIC-LESO-PB | ETHZ_D-PHYS_IPA | | Bruker | Oxford_Ionics |
| STI-IEM-GR-SCI | STI-IMX-LMGN | SB-ISIC-LAS | ENAC-IIC-LMS | ETHZ_D-PHYS_LFKP | | Colibrys | Pi_Imaging |
| STI-IEM-ICLAB | STI-IMX-LMM | SB-ISIC-LPDC | ENAC-IIE-LTE | FCBG | | Creal | Piemacs |
| STI-IEM-LAFT | STI-IMX-LMOM | SB-ISIC-LPI | | HES-SO-FR_ChemTec | | EXALOS | Pierhor_Gasser |
| STI-IEM-LAI | STI-IMX-LMSC | SB-SCI-RH | | HES-SO-GE_inSTI | | FEMTOprint | Preciflex |
| STI-IEM-LANES | STI-IMX-LP | SB-SPC-BPP | | HES-SO-GE_inSTI_2 | | H_Glass | Richemont |
| STI-IEM-LAPD | STI-IMX-LPAC | | | HES-SO-VS | | Hexisense | Rolex |
| STI-IEM-LMIS1 | STI-IMX-QMAT | | IC-IINFCOM-LCAV | Metas | | ID_Quantique | SEED |
| STI-IEM-LMIS2 | STI-IMX-SMAL | | | PSI_PSD-LMN | | Imec | Sigatec |
| STI-IEM-LMIS4 | STI-SCI-CD | | | UNIBAS | | Innoview | Silicon_Austria_7 |
| STI-IEM-LMTS | STI-SCI-DD | | | UNIFR_Chemistry | | KEP_Innov | Sprynga |
| STI-IEM-LO | STI_SEL (TP nanoelec) | | | UNIGE_Biochem | | Ligentec | Sunbioscience |
| STI-IEM-LPMAT | STI_SMT (TP micro 332) | | AVP-CP_ECAL | UNIGE_GAP | | Lionix_Intl | TrueDyne_Sensors |
| STI-IEM-LSBI | STI_SMT (TP micro 501) | | | UNIGE_Physique | | LSPR | Xsensio |
| 48 (369) | | 16 (79) | 11 (26) | 30 (41) | | 48 (95) | |

# of laboratories

# of users

- Total: 153 labs & companies (employing 560 users)

# Users in 2021

Philippe Flückiger 03.05.2022

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| | STI-IEM-PV-LAB | S | S | CHUV | Niels_Bohr_Inst_D | A | MCH-processing |
| | STI-IGM-EMSI | S | S | CSEM_E1 | UCLouvain | | Mistic |
| | STI-IGM-LNET | S | SV-IS | CSEM_T1 | UNI-SUSSEX-PH-IQT | | Morphotonix |
| | STI | S | | CSEM-Muttenz | | | Nanoga |
| STI-IE | STI | S | | EMPA | | | Nanoworld |
| STI-IEM-AQUA | STI | SB-IPHYS-LQM | | ETHZ | | Axetris | Neroxis |
| | STI | SB-IPHYS-LQP | | ETHZ | | Bloesch | Novagan |
| | STI-IMX-I | S | E | ETHZ | | Bruker | Oxford_Ionics |
| | STI-IMX-LMGN | S | ENAC-IIC-LMS | ETHZ | | Colibrys | Pi_Imaging |
| | STI-IMX-LMM | S | ENAC-IIE-LTE | FCBG | | Creal | Piemacs |
| | STI-IMX-LMOM | S | | HES-SO-FR_ChemTec | | EXALOS | Pierhor_Gasser |
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| STI-IEM-LANES | STI | SB-SPC-BPP | | HES-SO-GE_inSTI_2 | | H_Glass | Richemont |
| STI-IEM-LAPD | STI | | | HES-SO-VS | | Hexisense | Rolex |
| STI-IEM-LMIS1 | STI | | IC-IIN | Metas | | ID_Quantique | SEED |
| STI-IEM-LMIS2 | STI | | | PSI_PSD-LMN | | Imec | Sigatec |
| STI-IEM-LMIS4 | STI-SCI | | | UNIBAS | | Innoview | Silicon_Austria_7 |
| STI-IEM-LMTS | STI-SCI-DD | | | UNIFR_Chemistry | | KEP_Innov | Sprygns |
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Bio Engineering

Mechanical Engineering

Electrical and Micro Engineering

Materials

Physics

Chemical Sciences and Engineering

Civil Engineering

Global health

Swiss Inst. for experimental cancer research

Environ-mental engineering

CERN
CSEM EMPA
ETHZ
Universities

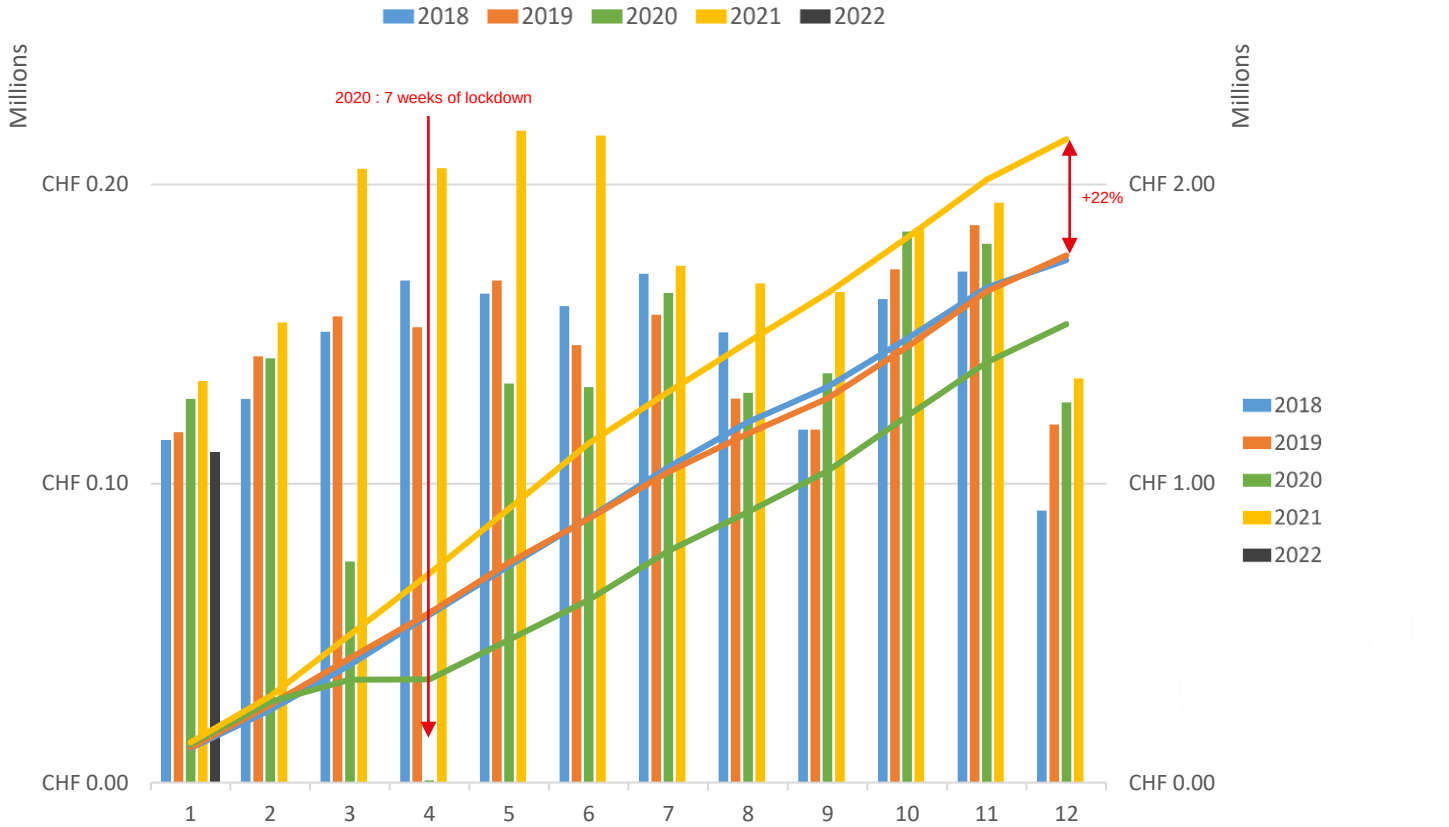
Startups
SMEs
Big companies

# of laboratories

# of users

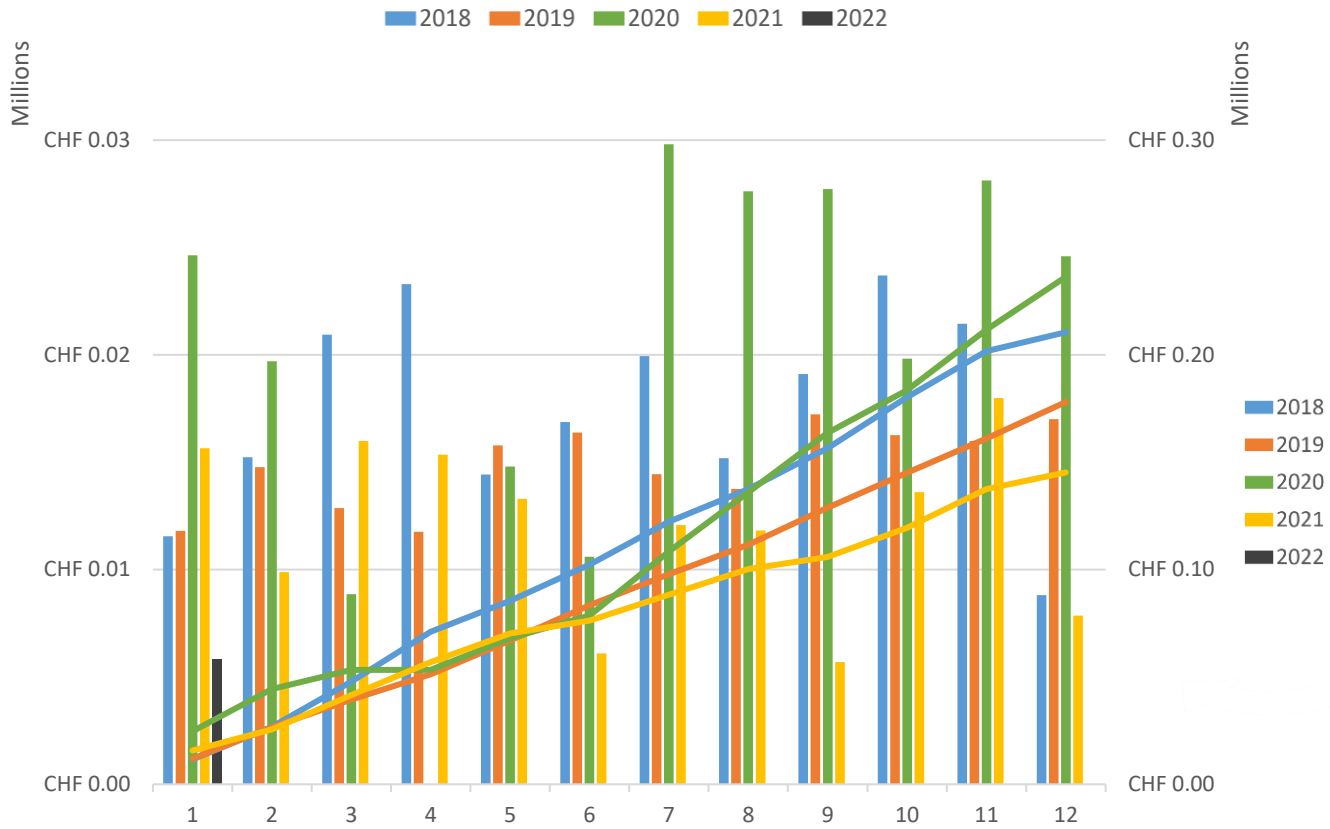
- Total: 153 labs & companies (employing 560 users)

# Invoicing to internal EPFL Users




- 2.15MCHF invoiced in 2021 to our internal EPFL users (62% of the total)

# Invoicing to external academic Users




- 0.15MCHF invoiced in 2021 to our external academic users (4% of the total)

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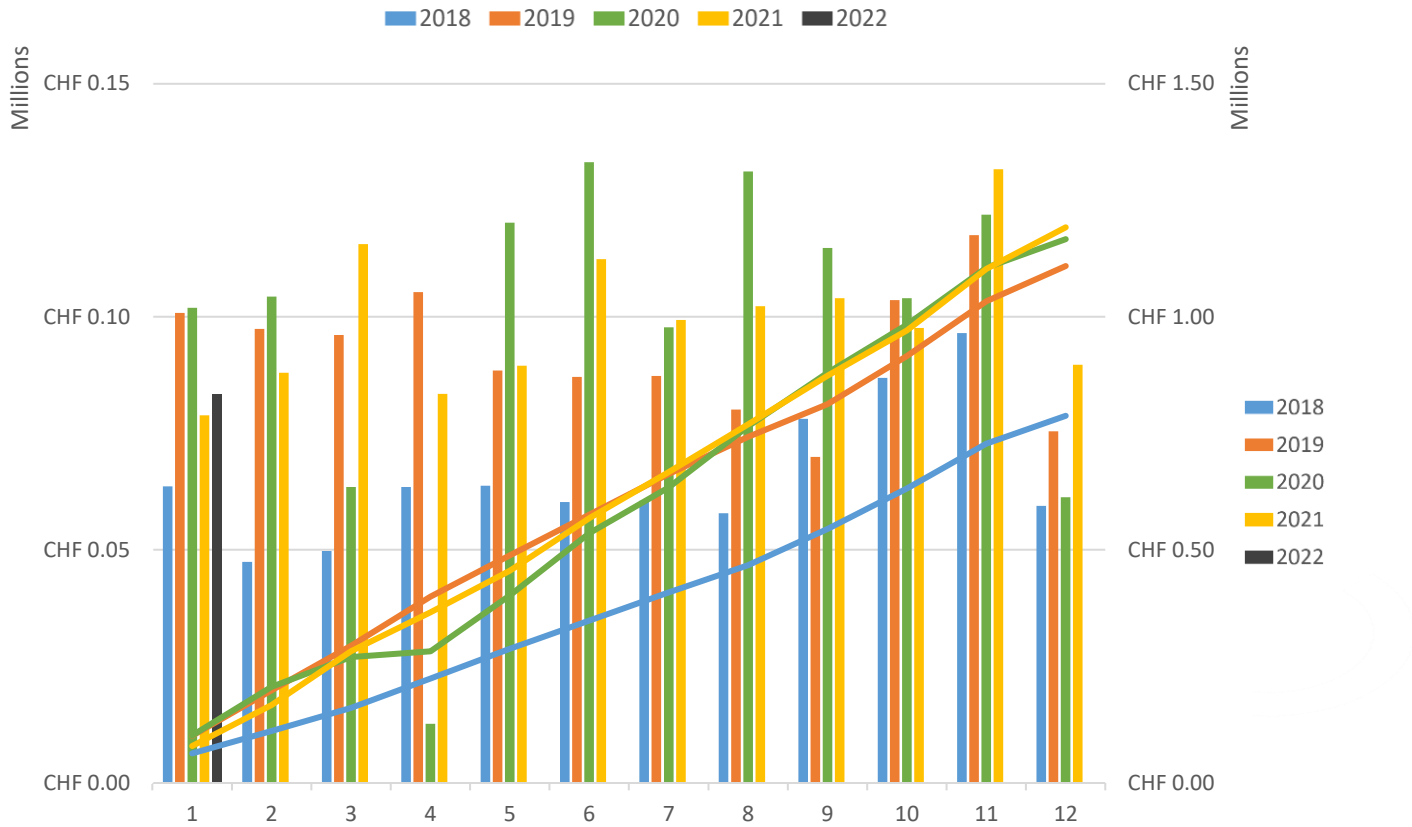
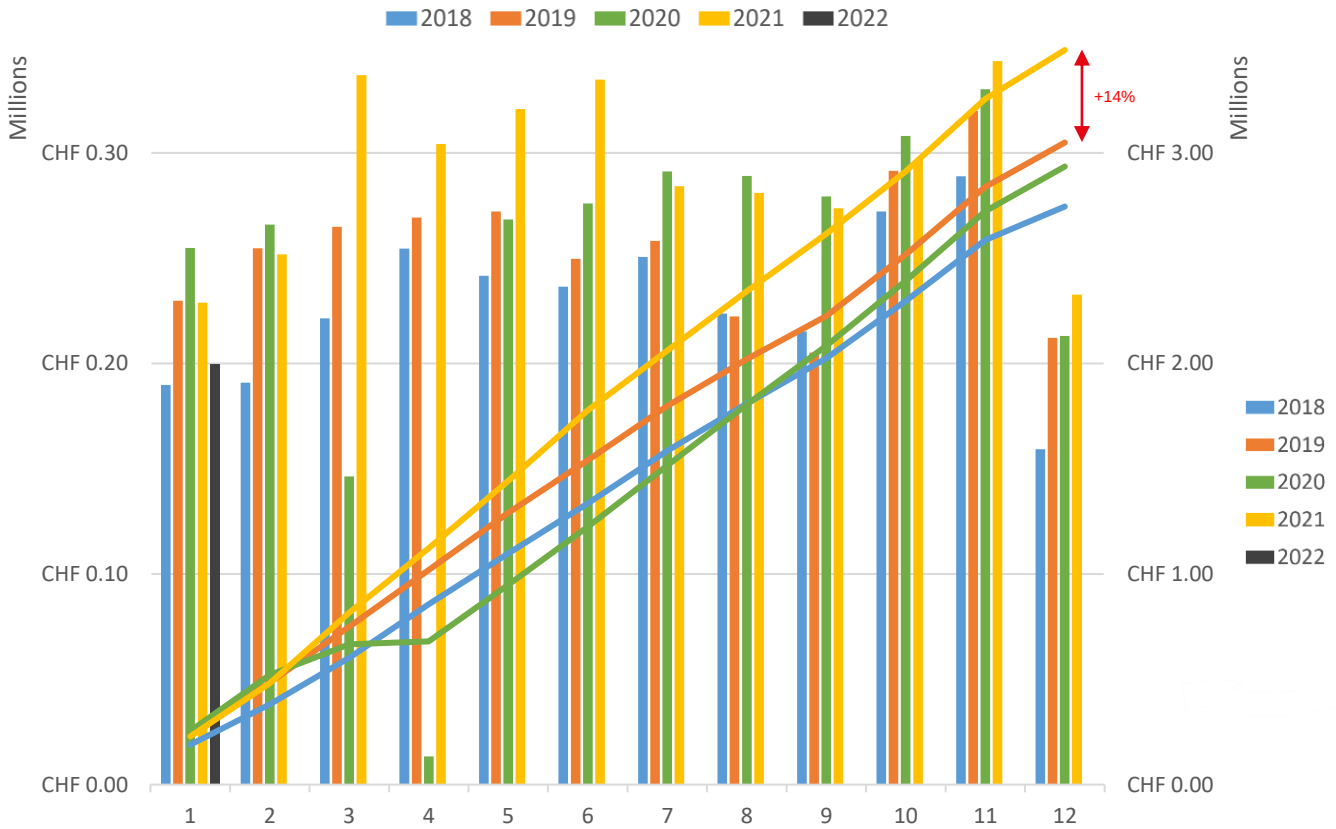
# Invoicing to companies




- 1.19MCHF invoiced in 2021 to our industrial users (34% of the total)

# Total invoicing to all users




- 3.49MCHF invoiced in 2021 in total (+14% compared to 2019)



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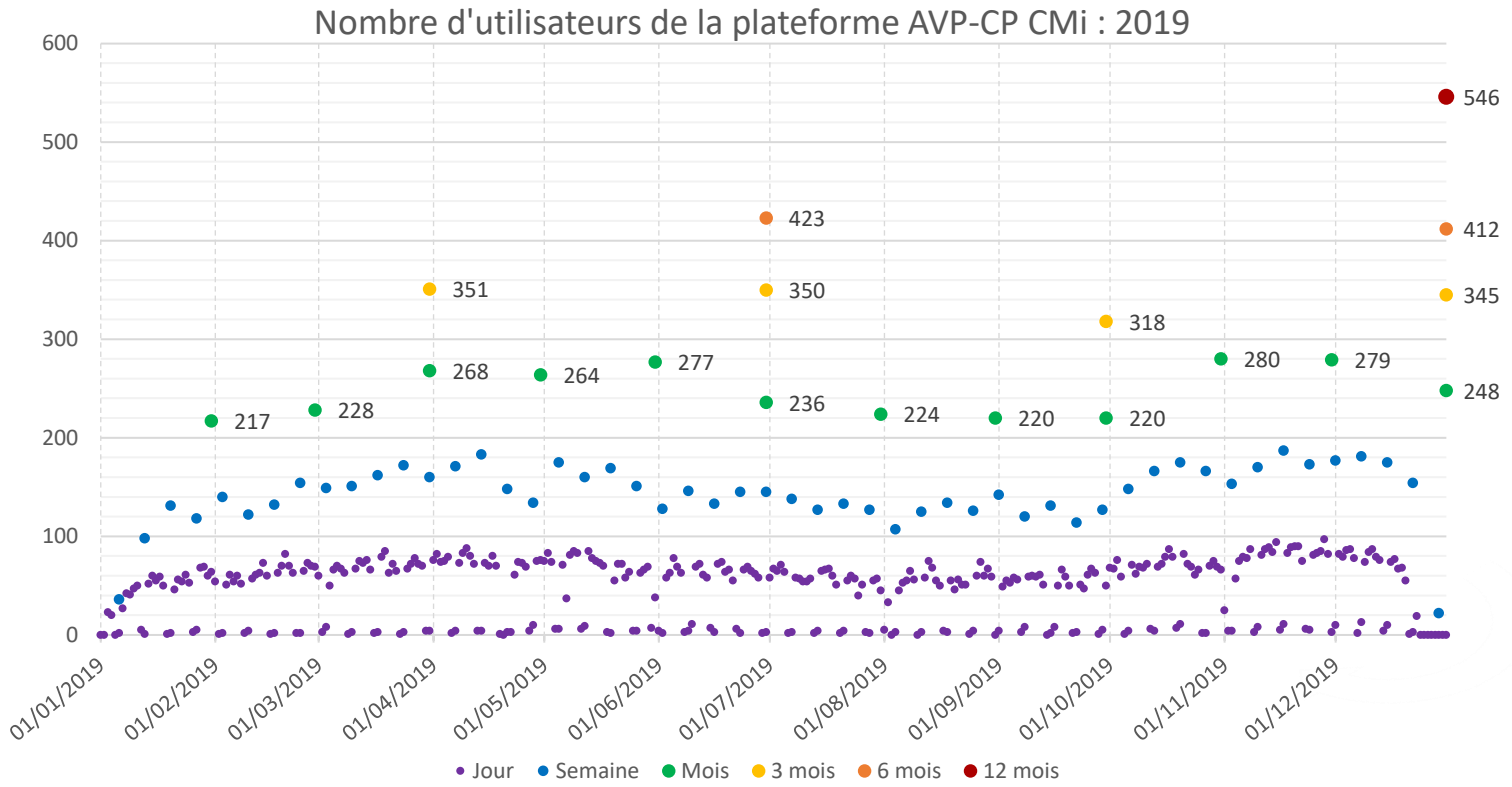
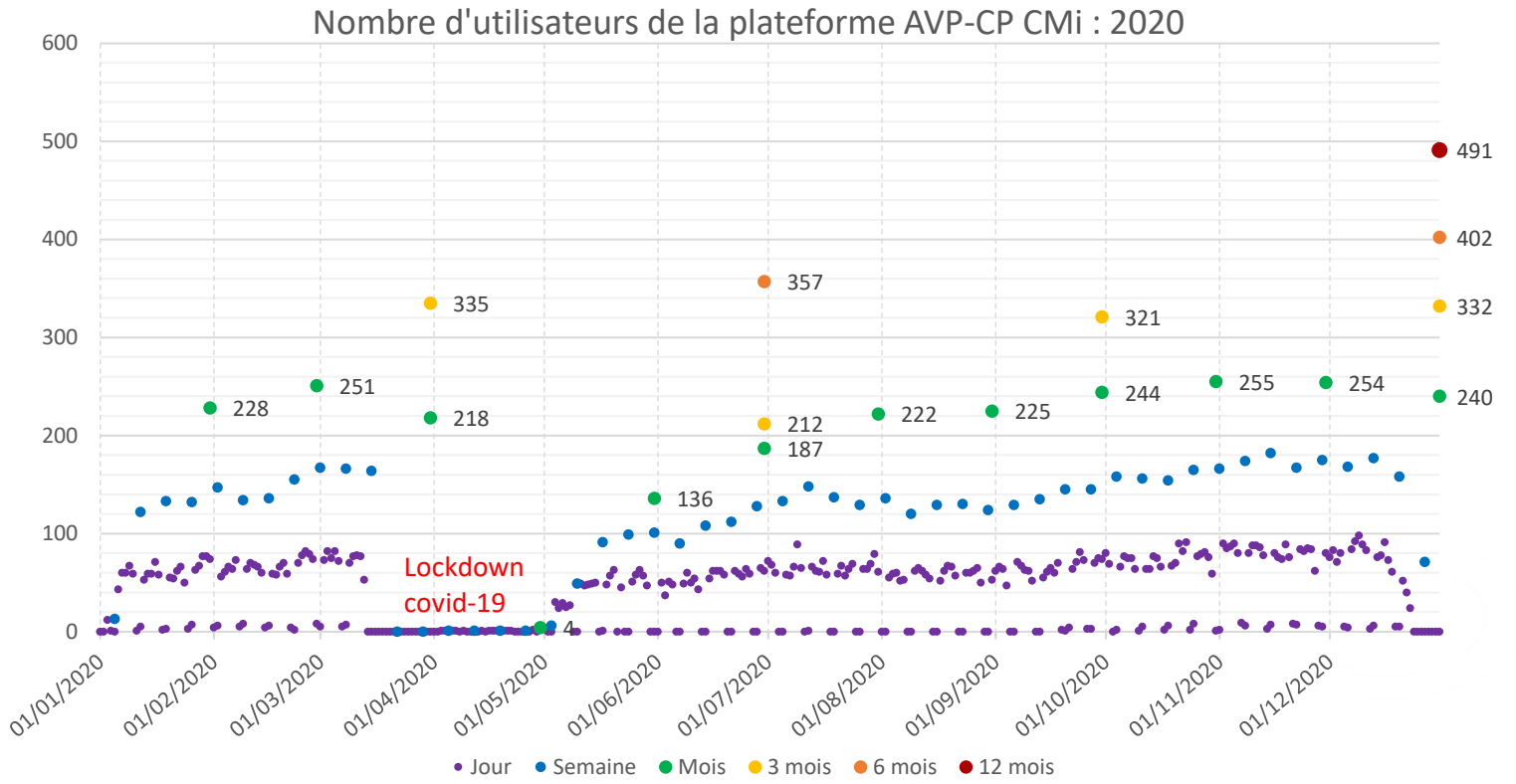
# Users in 2019



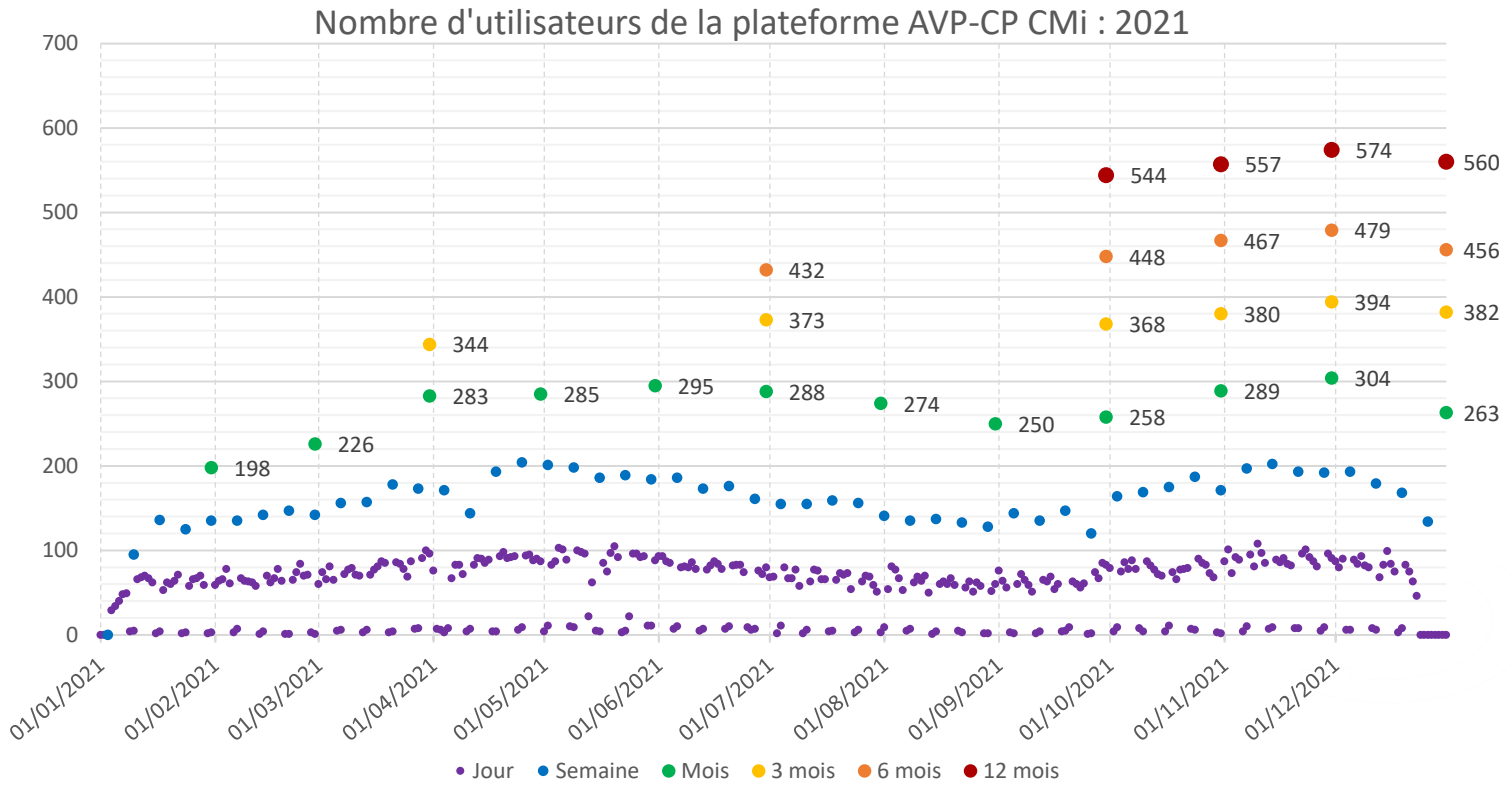

- Number of users per day/week/month/quarter/semester/year
- 546 users in 2019

# Users in 2020



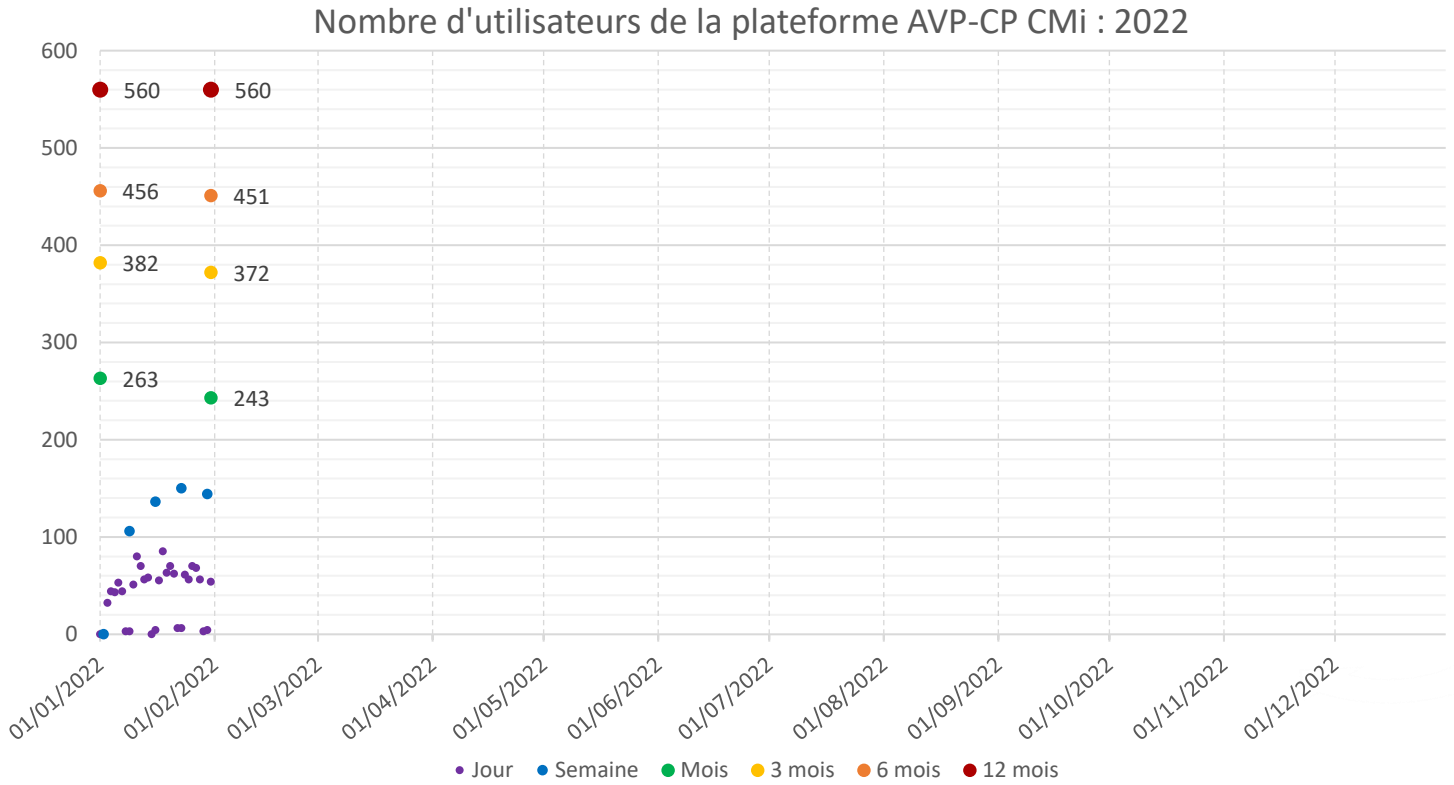

- 491 users in 2020 (-10% compared to 2019)
- Decrease explained by COVID-19 restrictions applied to the campus

# Users in 2021




- 560 users in 2021 (+2.6% compared to 2019)
- Back to growth

# Users in 2022




- Number of users recalculated each month

# COVID-19 impact on dressing

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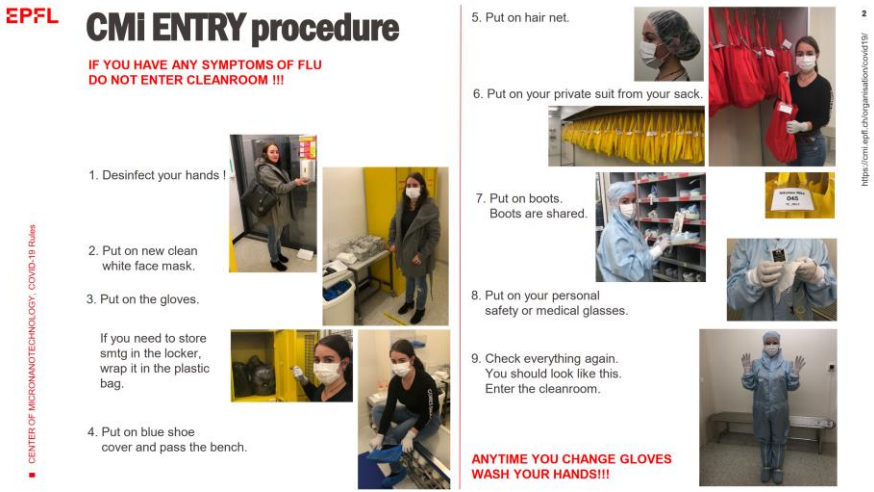


EPFL

## CMi ENTRY procedure

IF YOU HAVE ANY SYMPTOMS OF FLU
DO NOT ENTER CLEANROOM !!!

1. Desinfect your hands !
2. Put on new clean white face mask.
3. Put on the gloves.

If you need to store smtg in the locker, wrap it in the plastic bag.

4. Put on blue shoe cover and pass the bench.
5. Put on hair net.
6. Put on your private suit from your sack.
7. Put on boots. Boots are shared.
8. Put on your personal safety or medical glasses.
9. Check everything again. You should look like this. Enter the cleanroom.

ANYTIME YOU CHANGE GLOVES
WASH YOUR HANDS!!!

CENTER OF MICRONANOTECHNOLOGY, COVID-19 Rules

https://cmi.epfl.ch/organisation/covid19/

## COVID-19 impact

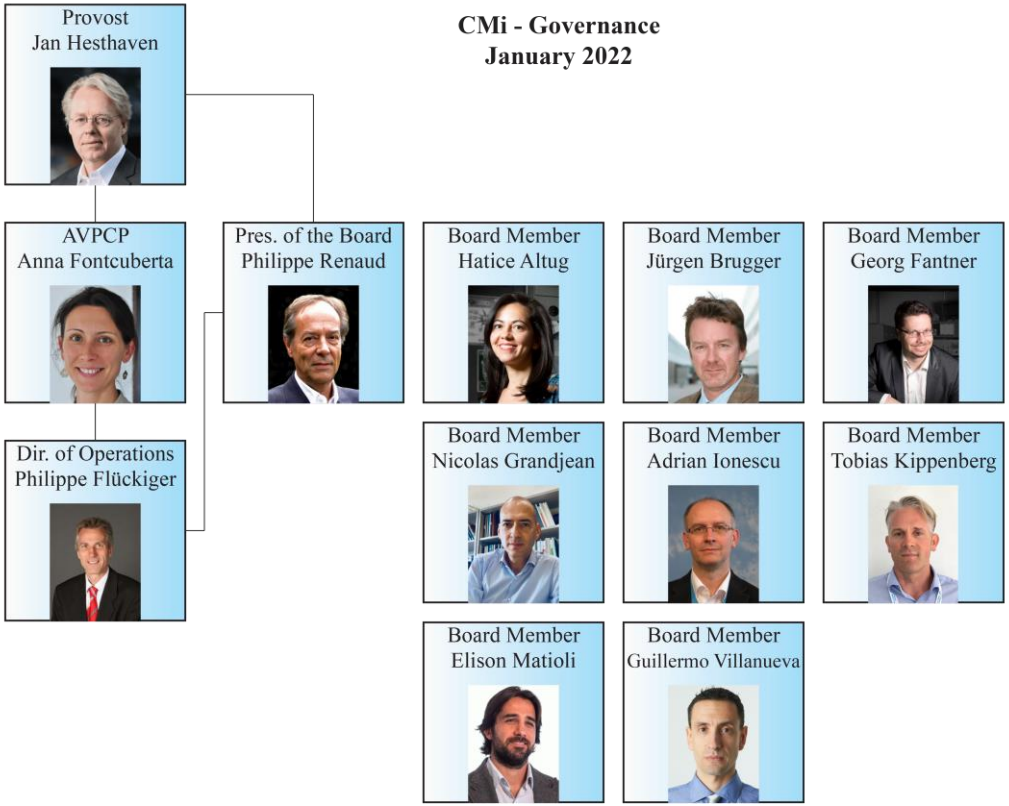
- The cleanroom garments are no longer shared among multiple users.
- Everyone has one designated cleanroom suit assigned for his/her personal use only.

COVID-19

Before the COVID-19

- The private suits are stored in private sacks since May 2020

# Governance




## Governance

- Since January 2021 the CMi reports to the Associate Vice President for Centers and Platforms and to the Vice-President for Academic Affairs.
- Our executive board is composed of 9 Professors including our president
- Members nominated for a period of 4 years from 01.11.2018 until 31.10.2022

- New direction at EPFL since 01.01.2021

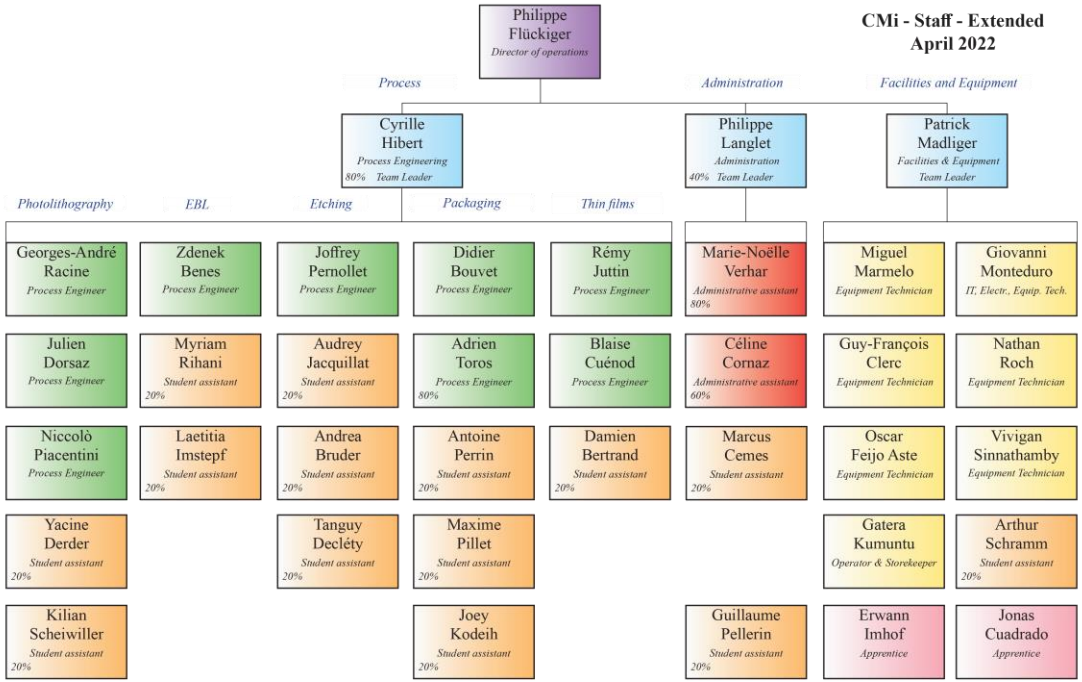
# Staff


## Staff

- Staff composed of 20.4 FTE employees
- We have plans to increase to 23.4 FTE employees by 2023
- 3 employees are currently still under non-permanent positions
- Employ 14 student assistants (part time)
- Train 2 apprentices

- Our staff is specialized in Process / Administration / Facilities and Equipment

# Staff



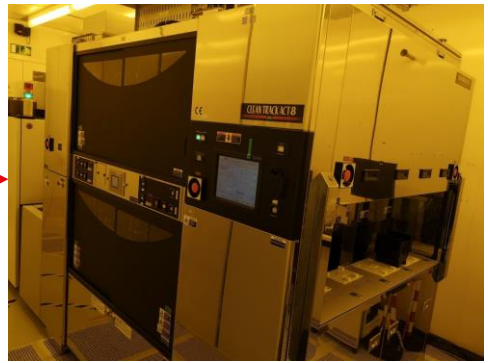

## Staff

- Staff composed of 20.4 FTE employees
- We have plans to increase to 23.4 FTE employees by 2023
- 3 employees are currently still under non-permanent positions
- Employ 14 student assistants (part time)
- Train 2 apprentices

- The 14 student assistants play an important role in the daily operations
- They provide services and they perform training for the new users

# New Tools

| | Delivery | |
|---|---|---|
| 1 | 2019 | Spectro reflectometer Filmetrics |
| 2 | 2019 | Microscopes optiques Leica (7x) |
| 3 | 2019 | Upgrade IBE Veeco |
| 4 | 2019 | Système de mesure du champ EM et des vibrations |
| 5 | 2019 | DUV stepper ASML |
| 6 | 2020 | Post CMP cleaner GnP |
| 7 | 2020 | Critical Point dryer Tousimis |
| 8 | 2021 | Silicon etcher SPTS Rapier |
| 9 | 2021 | Profilomètre optique Contour-X 200 Bruker |
| 10 | 2021 | Coater/developer TEL ACT-8 cleantrack |
| 11 | 2021 | Système d'alignement Athena ASML |
| 12 | 2021 | Déménagement stepper ASML |
| 13 | 2021 | Prober MTI TS150 |
| 14 | 2021 | Manual spin coater LSM150 Z13 Sawatec |
| 15 | 2021 | Rénovation SRD (4x) Peritest |
| 16 | 2021 | Polisseuse CMP2 Alpsitec |
| 17 | 2021 | UHV evaporator Plassys |
| 18 | 2021 | XeF2 Vapor etcher SPTS Xactix X4 |
| 19 | 2021 | Automatic wire bonder F&S Bondtec |
| 20 | 2022 | Hottes solvants Herren |
| 21 | 2022 | Fours LPCVD Centrotherm |
| 22 | 2022 | Flash annealing system Rovak |
| 23 | 2022 | HMDS YES |
| 24 | 2022 | Spectro reflectometer Filmetrics |
| 25 | 2022 | Resistivity measurements Filmetrics |
| 26 | 2022 | ICP-PECVD Oxford |
| 27 | 2022 | PECVD |
| 28 | 2022 | PR stripper ESI |
| 29 | 2022 | PVD Cluster Alliance Concept |
| 30 | 2022 | Direct Writer MLA150 |
| 31 | 2022 | Ellipsometer Woollam RC2 |
| 32 | 2022 | Graveur metal |
| 33 | 2022 | Wafer Bonder EVG |
| 34 | 2022 | SEM Zeiss Merlin |
| 35 | 2022 | CVD diamant IPLAS |
| 36 | 2022 | FIB Zeiss Crossbeam |
| 37 | 2023 | EBL2 |
| 38 | 2023 | Evaporateur Joule |
| 39 | 2023 | SIMS IBE |
| 40 | 2023 | Profilomètre mécanique |
| 41 | 2023 | Coucheuse manuelle |
| 42 | 2023 | Evaporateur Lift-off |
| 43 | 2023 | Coucheuse automatique |
| 44 | 2023 | Dielectric etcher |



## DUV stepper lithography

- ASML PAS 5500/350C
- 248nm
- TEL ACT-8
- Stepper connected to the coater
- Resolution150nm
- Overlay accuracy <30nm
- 100mm wafers (150&200)
- 100 wafers per hour

- During these 5 years we are installing 44 new pieces of equipment !

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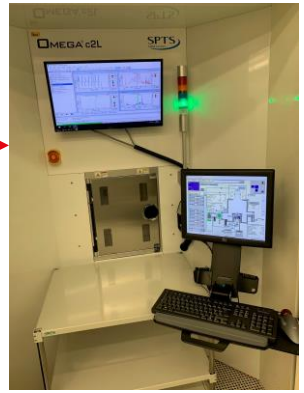


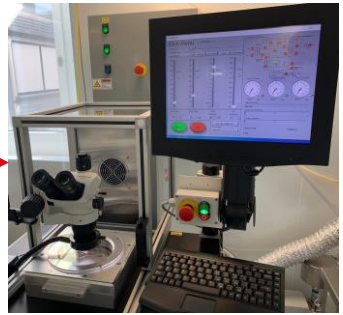

## Dry etching of silicon

- SPTS Rapier deep silicon plasma etcher in fluorine chemistry
- SPTS Xactix X4 XeF2 Vapor gas etcher

- Dry etching of silicon

# New Tools

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## CVD thin films deposition

- 4x Centrotherm furnaces including 2 LPCVD for ultrapure SiO2 and nitride.
- Oxford ICP PECVD for ultrapure SiO2 and nitride.
- IPLAS CVD diamond system (June 2022)

- CVD thin films deposition

# New Tools

Philippe Flückiger 03.05.2022

| | Delivery | |
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| 1 | 2019 | Spectro reflectometer Filmetrics |
| 2 | 2019 | Microscopes optiques Leica (7x) |
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| 5 | 2019 | DUV stepper ASML |
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| 8 | 2021 | Silicon etcher SPTS Rapier |
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| 10 | 2021 | Coater/developer TEL ACT-8 cleantrack |
| 11 | 2021 | Système d'alignement Athena ASML |
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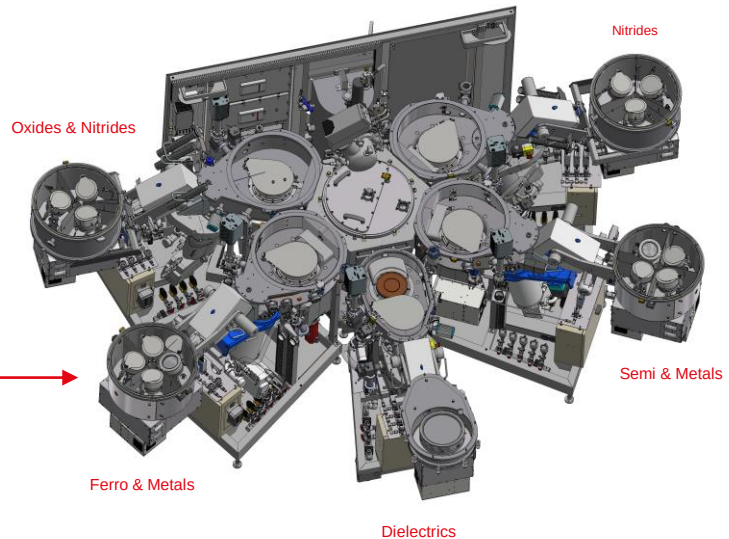
| 43 | 2023 | Coucheuse automatique |
| 44 | 2023 | Dielectric etcher |




## PVD Cluster Tool

- Alliance Concept CT-200
- 5 chambers
- Oxides & nitrides (3x100mm)
- Ferro & metals (4x100mm)
- Dielectrics (1x250mm)
- Nitrides (3x100mm)
- Semi & metals (4x100mm)

- A new PVD Cluster Tool with 5 chambers will be delivered soon

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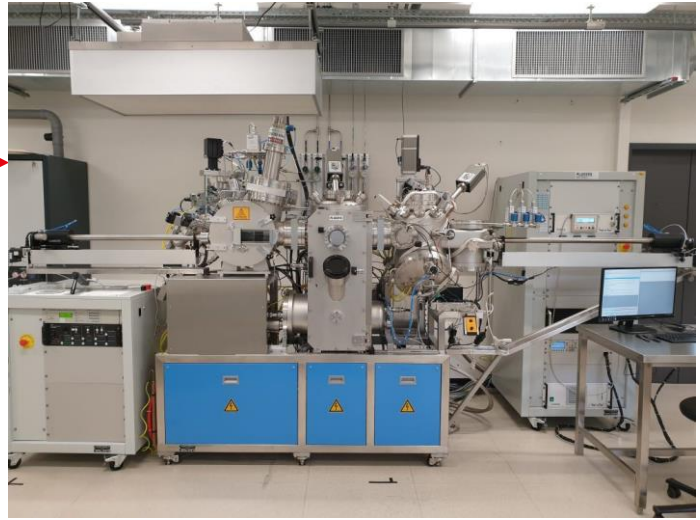
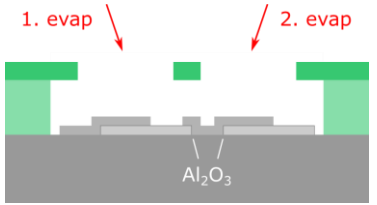


## UHV Evaporator

- Plassys MEB550SL3
- 1x load lock
- 1x evaporation chamber (UHV)
- 1x oxidation chamber (UHV)




Principle of the two-angle evaporation: the bridge is exposed so that only the bottom layer of resist is fully developed.

- UHV Evaporator for the fabrication of SIS Josephson Junctions

# New Tools

Philippe Flückiger 03.05.2022

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## Wafer Bonder

- EVG 810/301/610/510
- 1x plasma activation
- 1x single wafer cleaning
- 1x optical alignment
- 1x bonding

- EVG wafer bonding line to be delivered in 2023

# New Tools

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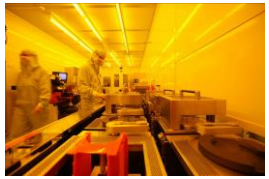


## New projects

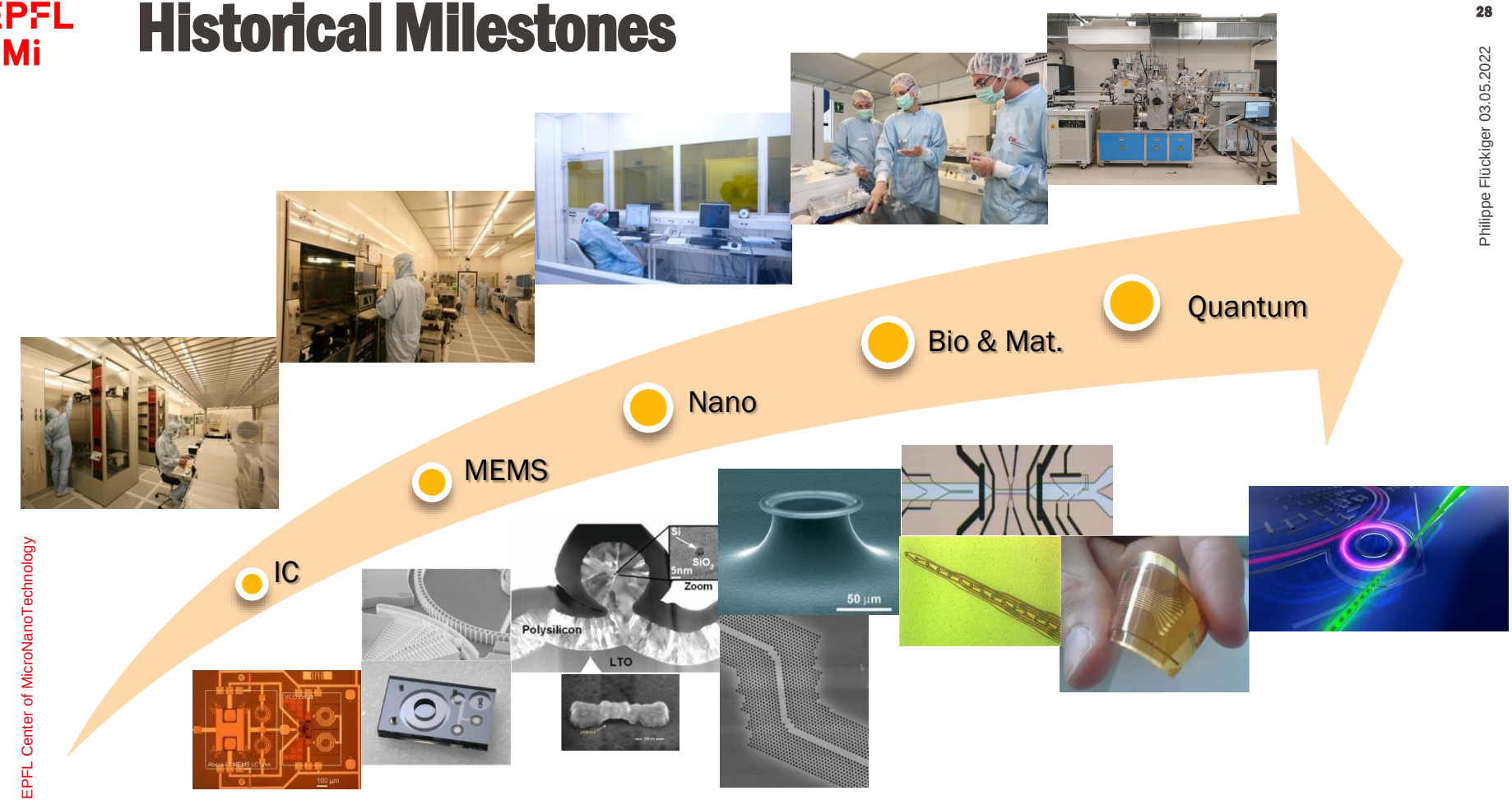
- An electron beam lithography system (2005)
- A lift-off evaporation system dedicated to oxides (2004)
- An automatic photolithography coater & developer for the replacement of 2 aging tools RT & EVG (1998 & 2004)
- A plasma etcher for dielectric etching (2012) dedicated to high purity samples without metal contaminations

- The direction of the school has decided to initiate new projects in 2022.

# Historical Milestones

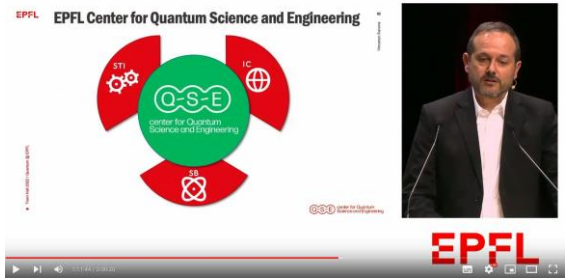
| | |
|---|---|
| Microelectronics & MEMS<br>1998 | • CMi created in 1998 & Cleanroom opened in March 1999<br>• Basic Microelectronics processes<br>• MEMS processes like **Deep silicon etching**, **SU-8** |
| Nano<br>2005 | • **Electron Beam Lithography** ordered in december in 2005<br>• Focused Ion Beam ordered in september 2003<br>• Atomic Layer Deposition in 2011 |
| Cleanroom extension 24/7<br>2010 | • Cleanroom extension opened in 2010 for **more flexibility** and cheaper access<br>• **Operated now in 24/7 mode** since 2012<br>• **PDMS**, SU-8, Chemistry, Metrology, Non-conventional processes |
| Materials Diversity<br>2013 | • **Ion Beam Etching**, PVD, ALD, PLD, Dry Etching<br>• Chemistry<br>• Photolithography: Mask Fabrication, Coater & Developer, Mask Aligner |
| DUV Stepper lithography<br>2019 | • **DUV stepper**<br>• Renewal of aging tools & Adding new capabilities<br>• Envision the acquisition of a second EBEAM at the horizon of 2022 |
| Renewal & Broadening<br>2019-2022 | • Deep Si etcher - XeF2 etcher - CMP - Post CMP Cleaner - Super Critical Dryer - Metal etcher<br>• **PVD Cluster** - LPCVD furnaces - PECVD - Flash Lamp Annealing - Direct Writer<br>• **Wafer bonding** - CVD diamond - Optical Profiler - SEM - Ellipsometer |
| Quantum Science & Engineering<br>2022 | • UHV evaporator for **Josephson Junctions** - HD PECVD<br>• Second electron beam lithography system |

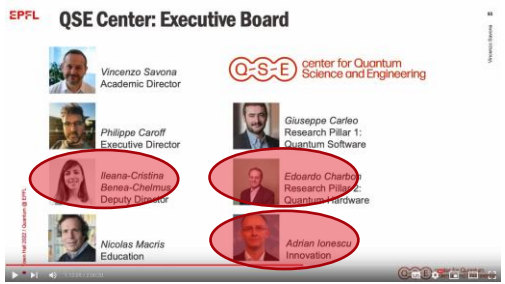
# Historical Milestones

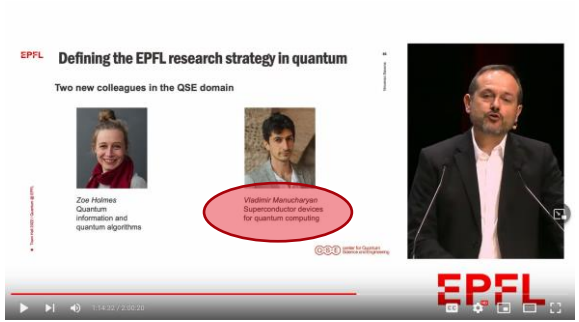


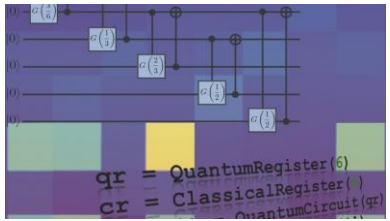

- Broadening the CMi offer and the CMi users base along the time by incorporating

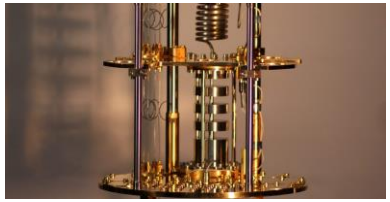
# Historical Milestones



## QSE at EPFL

- Created in 2022
- Two research pillars :
- Research Pillar I: Applied quantum algorithms and data science
- Research Pillar II: Quantum hardware materials and systems
- Pillar 2 will be leveraging the advanced nanofabrication facilities present on campus

- EPFL Center for quantum Science and Engineering

# Cleanroom


| | |
|---|---|
| Initial surface BM-1 (1998) | 1000m$^2$ |
| Extension BM+1 (2010) | 300m$^2$ |
| Extension BM0 (2017) | 100m$^2$ |
| Extension BM0 (2022) | 350m$^2$ |
| **Total Surface** | 1750m$^2$ |

- 2022: Transform the space received from the STI at level BM0 into a grey area

# Capital Investment

- Processing Equipment

| | |
|---|---|
| Scientific Equipment Levels -1 / 0 / +1 | 40 MCHF |
| **Total** | **40 MCHF** |

- Cleanroom Infrastructures

| | |
|---|---|
| Cleanroom Infrastructures Level -1 | 12 MCHF |
| Cleanroom Infrastructures Level +1 | 7 MCHF |
| Greyroom level 0 | 2 MCHF |
| **Total** | **21 MCHF** |

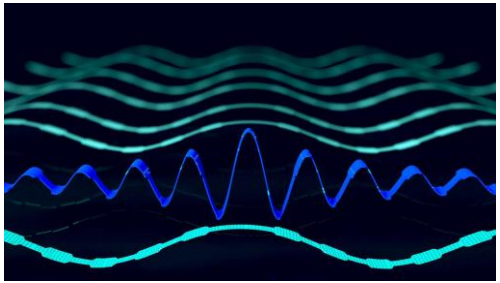
- Total 61MCHF

# CMi inside

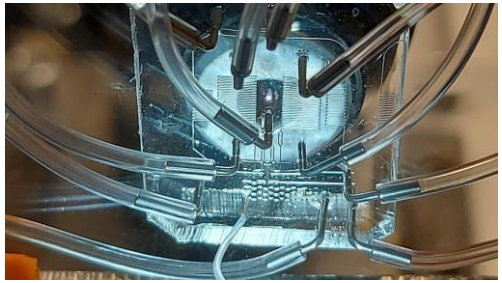




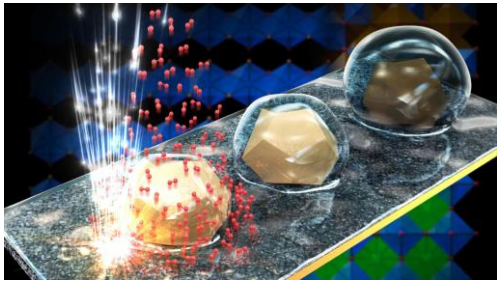
Kippenberg (RESONATORS)
Nature Physics
https://doi.org/10.1038/s41567-021-01498-4
March 2022



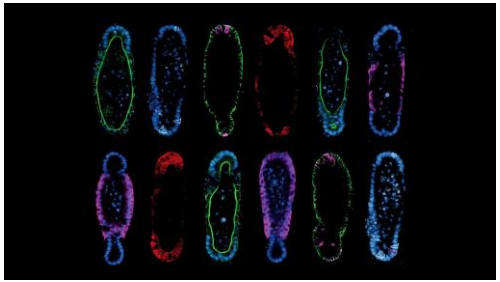
Deplancke (RNA SEQUENCING)
Nature Methods
https://doi.org/10.1038/s41592-021-01391-1
February 2022



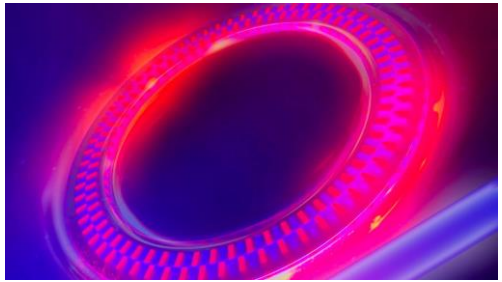
Tileli (NANOMATERIALS CHARACTERIZATION BY TEM)
Nature Catalysis
https://doi.org/10.1038/s41929-021-00723-w
January 2022



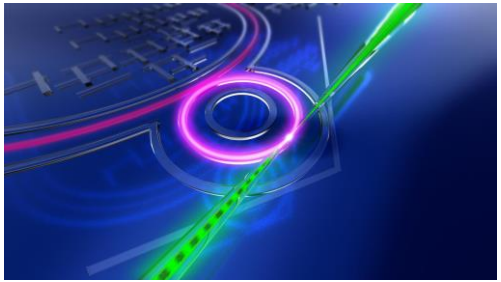
Lütolf (STEM CELL DERIVED ORGANOIDS)
Science
https://doi.org/10.1126/science.aaw9021
January 2022



Brès (RESONATORS)
Nature Photonics
https://doi.org/10.1038/s41566-021-00925-5
January 2022



Kippenberg (INTEGRATED PHOTONICS)
Nature
https://doi.org/10.1038/s41586-021-04197-5
December 2021



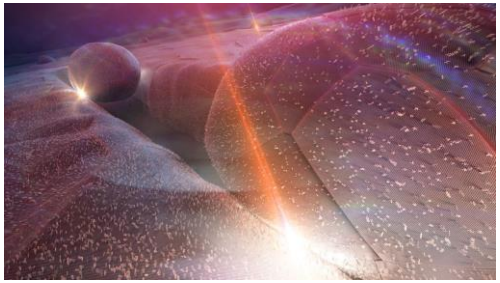
- A selection of publications which attracted special interest (last 12 months)
- Relayed onto the EPFL home page

# CMi inside

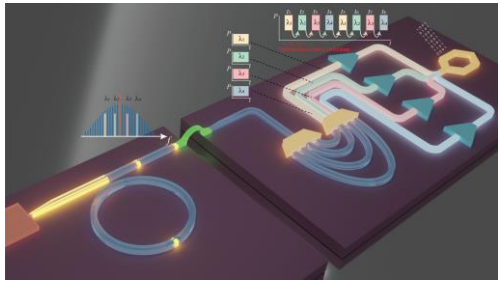




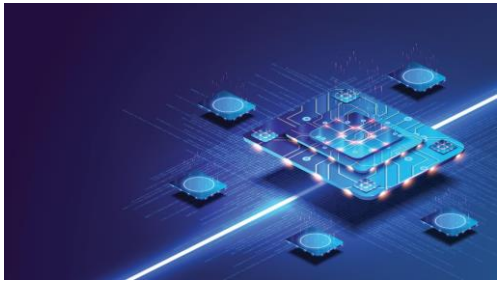
Galland (OPTOMECHANICS)
Science
https://doi.org/10.1126/science.abk3106
December 2021



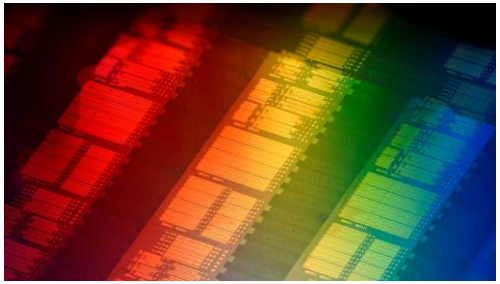
Kippenberg (OPTICAL CIRCUITS)
Nature Communications
https://doi.org/10.1038/s41467-021-25841-8
October 2021



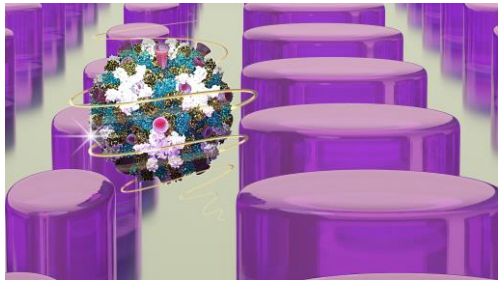
Savona (QUANTUM SCIENCE)
EPFL
https://actu.epfl.ch/news/epfl-launches-new-center-for-quantum-science-and-2/
August 2021



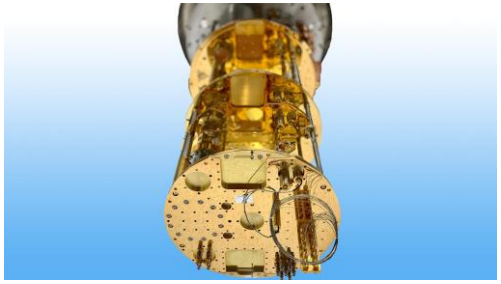
Kippenberg (SILICON PHOTONICS)
Science
https://doi.org/10.1126/science.abh2076
July 2021



Altug (OPTOFLUIDIC BIOSENSORS)
Nature Communications
https://doi.org/10.1038/s41467-021-23257-y
June 2021

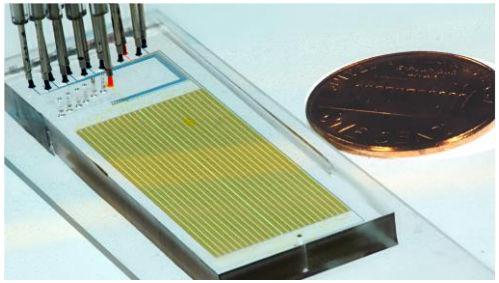


Kippenberg (CRYOGENIC INTERCONNECT)
Nature Electronics
https://doi.org/10.1038/s41928-021-00570-4
May 2021

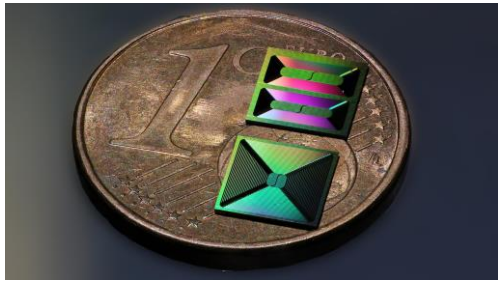


# CMi inside

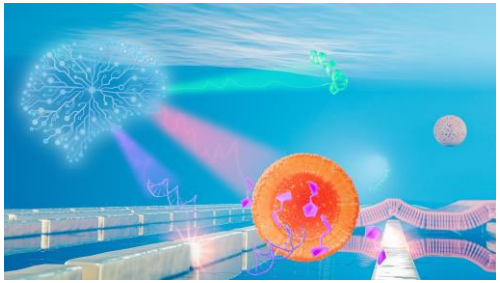
Maerkl (MICROFLUIDIC)
PNAS
https://doi.org/10.1073/pnas.2025289118
May 2021



Kippenberg (PHOTONIC CIRCUITS)
Nature Communications
https://doi.org/10.1038/s41467-021-21973-z
April 2021



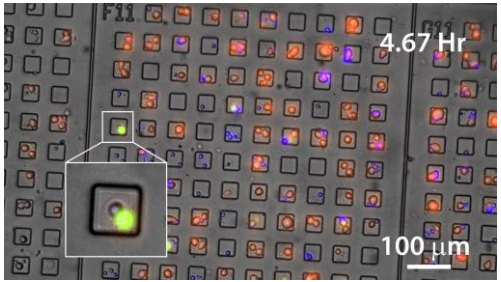
Altug (PLASMONIC BIOSENSORS)
Advanced Materials
https://doi.org/10.1002/adma.202006054
April 2021



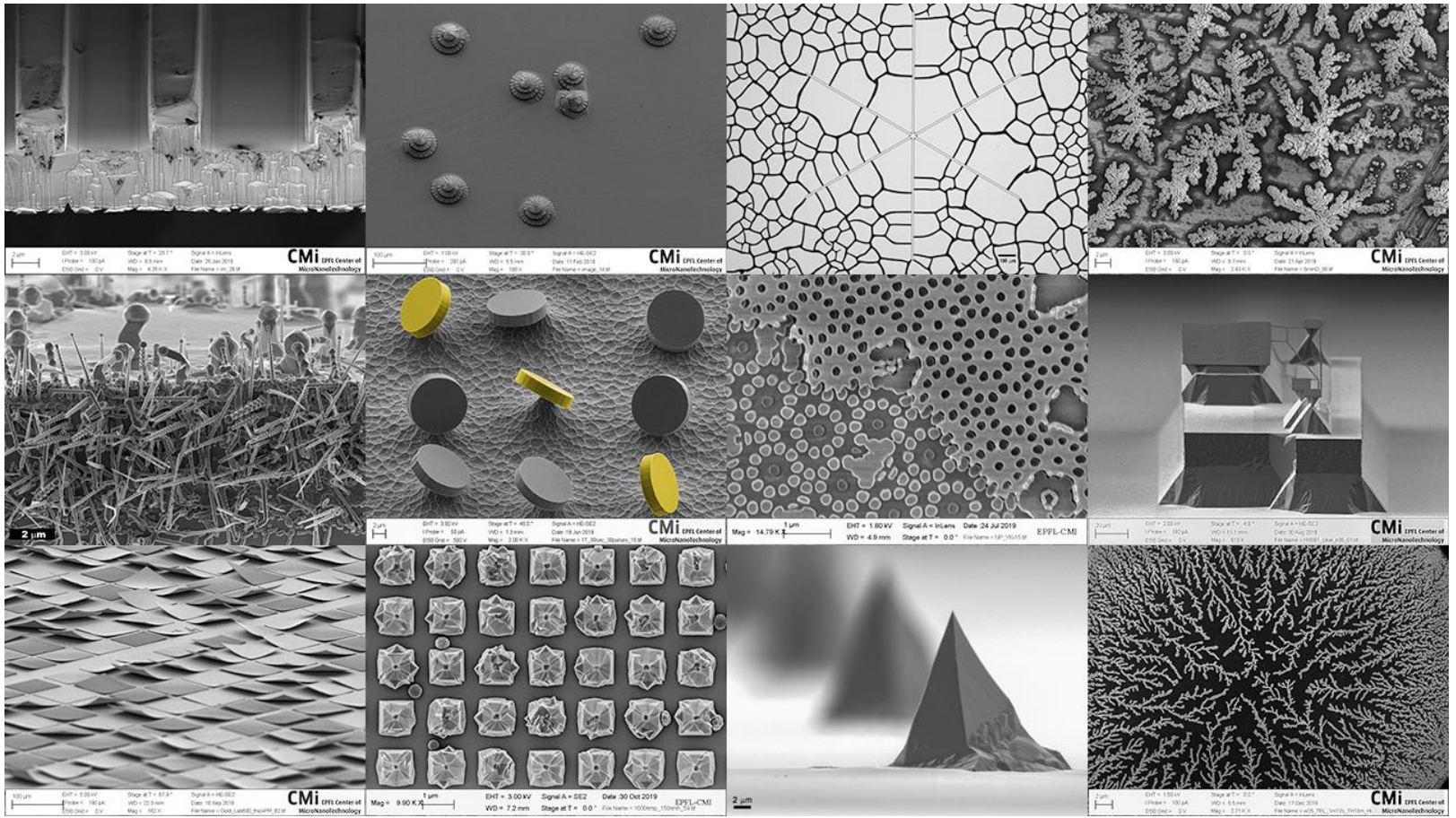
Ghezzi (RETINAL PROSTHESIS)
Communications Materials
https://doi.org/10.1038/s43246-021-00133-2
March 2021

Xanadu Ligentec (QUANTUM CIRCUITS)
Nature
https://doi.org/10.1038/s41586-021-03202-1
March 2021

Altug (HIGH-THROUGHPUT NANOBIOCHIP)
Science Advances
https://doi.org/10.1126/sciadv.abe3348
March 2021

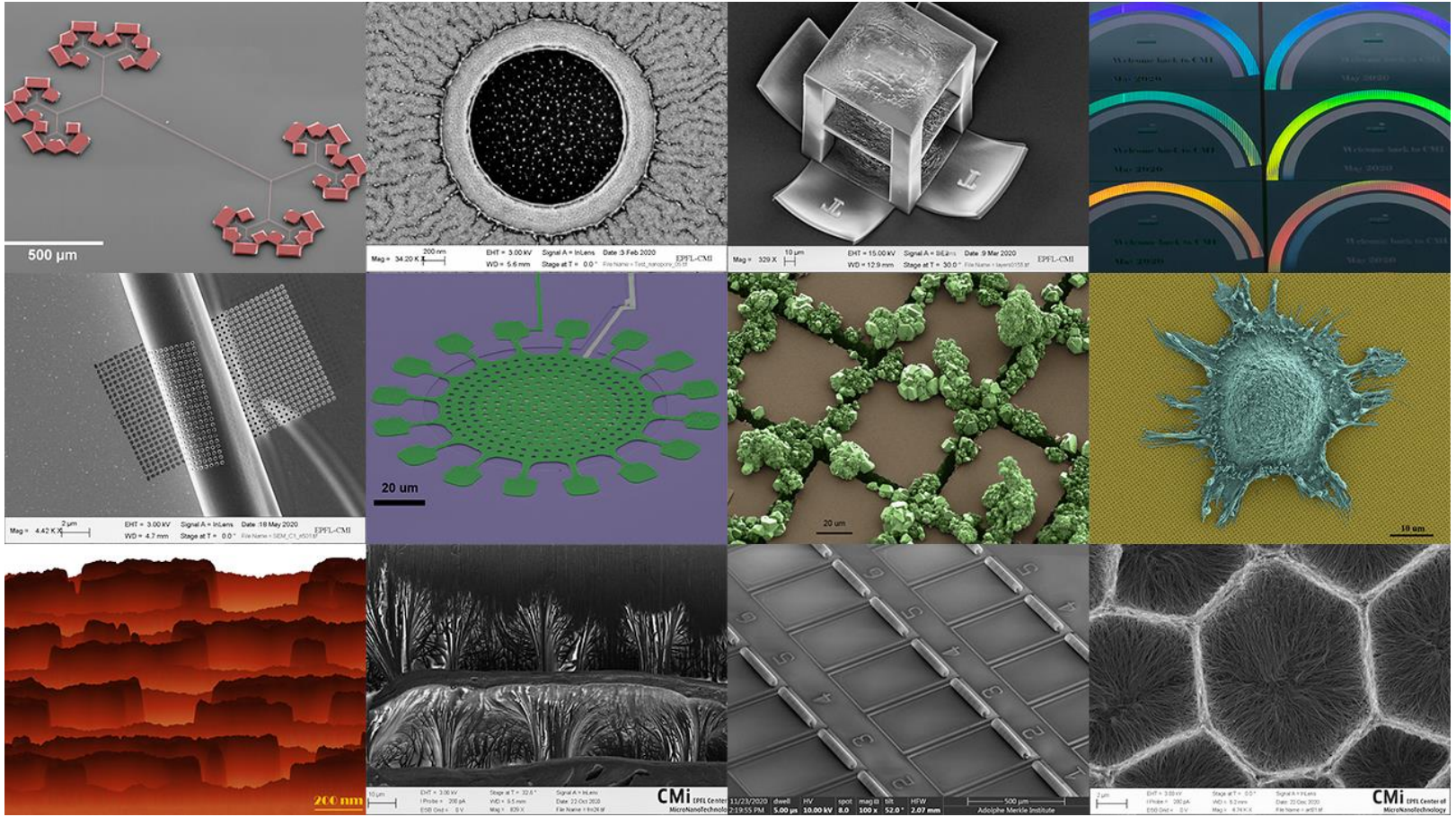


# Picture of the month 2019



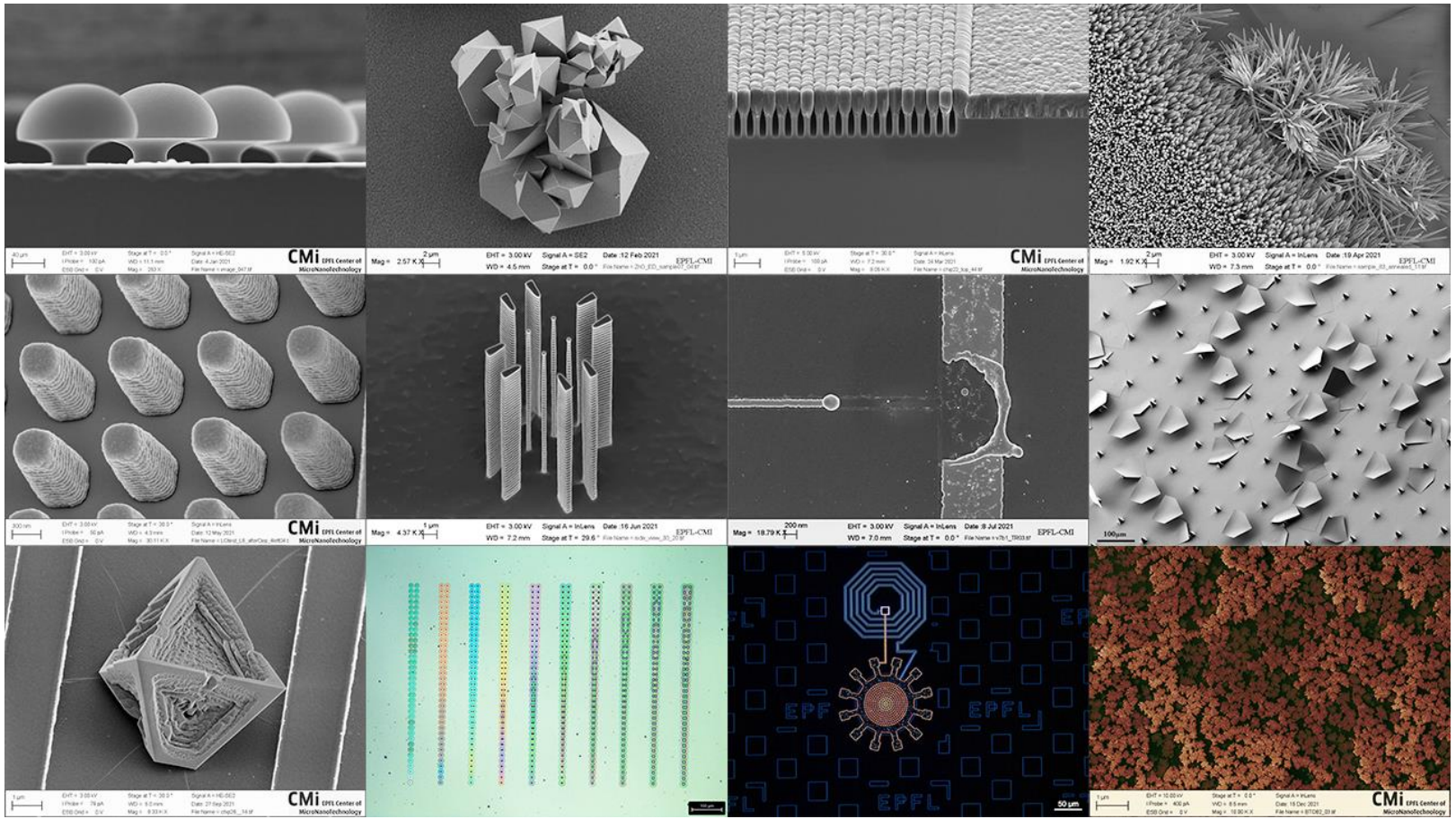
For the pleasure of the eyes : the official winners of the monthly picture contest

# Picture of the month 2020

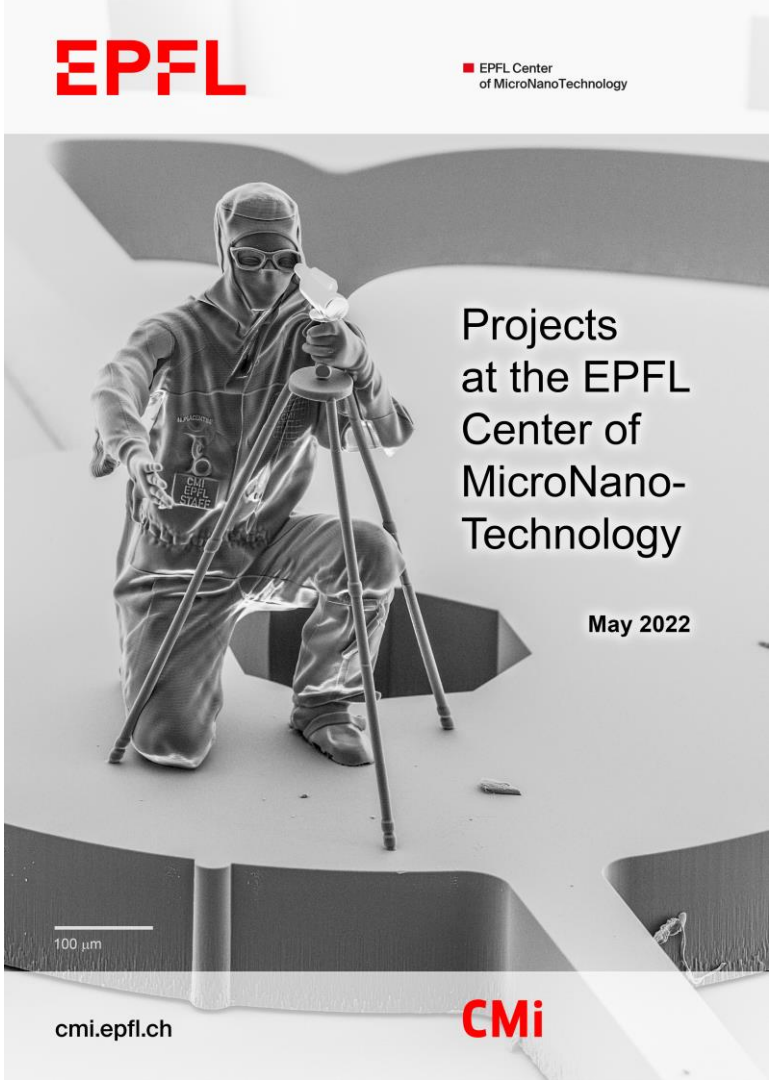



Philippe Flückiger 03.05.2022

# Picture of the month 2021



Philippe Flückiger 03.05.2022




## List of posters

- The 185 posters presented today are available online
- Password is available on request
- A few paper brochures are available

https://cmiaccess.epfl.ch/projects/

Front page: SEM image of our microns size colleague written with Nanoscribe

# Program

**09h30-10h00** Coffees and Croissants, Distribution of Badges and Proceedings

10h00-10h15 ***Philippe Renaud & Philippe Flückiger*** *https://cmi.epfl.ch/*, Introduction

10h15-10h30 ***Pasquale Scarlino***, *https://www.epfl.ch/labs/hqc/,* Superconducting-semiconducting hybrid quantum technology

10h30-10h45 ***Christoph Merten***, *https://www.epfl.ch/labs/lbmm/,* Droplet microfluidics in antibody discovery, immune repertoire sequencing and personalized cancer therapy

10h45-11h00 ***Giulia Tagliabue***, *https://www.epfl.ch/labs/lnet/,* Nanoantennas for energy and optical devices

**11h00-11h30** **Break**

11h30-11h45 ***Mitali Banerjee***, *https://www.epfl.ch/labs/lqp/,* Twisted graphene devices to explore many-body physics

11h45-12h00 ***Edoardo Charbon***, *https://www.epfl.ch/labs/aqua/,* Superconducting devices for quantum computing & sensing

12h00-12h15 ***Herbert Shea***, *https://www.epfl.ch/labs/lmts/,* Soft actuators for wearable haptics

**12h15-14h30** **Lunch & Poster Session**

14h30-14h45 ***Fabrizio Carbone***, *https://www.epfl.ch/labs/lumes/,* Nano-engineering the wavefunction of fundamental particles

14h45-15h00 ***John Martin Kolinski***, *https://www.epfl.ch/labs/emsi/,* Control of interface mechanics through engineered micro-structure

**15h00-15h30** **Break**

15h30-15h45 ***Christophe Galland***, *https://www.epfl.ch/labs/lqno/,* Molecules in plasmonic nanocavities for optomechanical transduction

15h45-16h00 ***Andras Kis***, *https://www.epfl.ch/labs/lanes/,* In-memory computing based on a 2D semiconductor

**16h00-17h00** **Cocktails & Poster Session**

## Program

- Very exciting program
- 10 presentations
- Spanning an exceptionally broad range
- Try to be different every year
- Not always invite our heavy users
- Emphasize on the new Professors @ EPFL
- Sometimes also some exotic users
- One common point:
- MicroNanoFabrication

# Program






## Exhibitors

- 34 companies
- Thank you to all of them

- Thank you to all our exhibitors

EPFL
CMi

Thank you to the CMi staff

EPFL
CMi

# Merci

Enjoy the conference
Thank you for your attention

**Philippe Flückiger**

École
polytechnique
fédérale
de Lausanne

EPFL
CMi


# Merci

Enjoy the conference
Thank you for your attention

**Philippe Flückiger**

École
polytechnique
fédérale
de Lausanne

# EPFL today

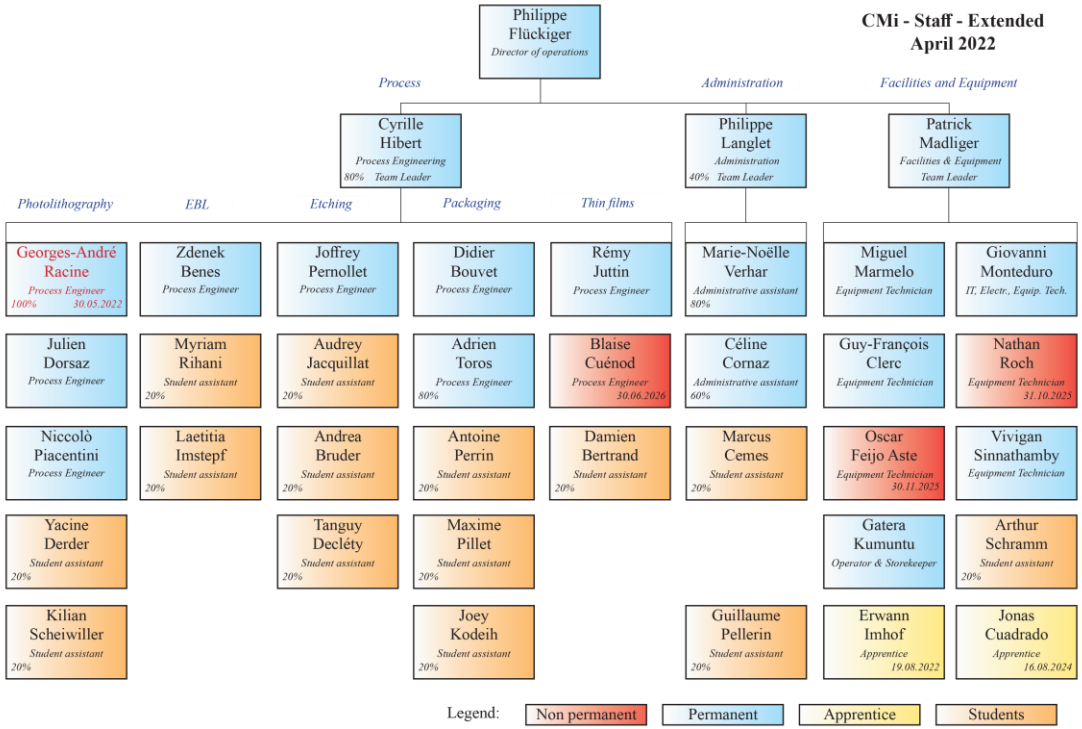

## Campus

- 11,449 students, of whom 2,199 PhD students
- 344 faculty
- 6,134 staff (incl. PhD)

## Structure

- 5 Schools (13 study prog. leading to an MSc)
- 2 Colleges
- 20 Institutes
- 44 research centers
- 371 laboratories

# Staff




- Staff April 2022

## Staff

- Staff composed of 20.4 FTE employees
- 3 staff members are currently still under non-permanent positions
- Employ 11 student assistants (part time)
- Train 2 apprentices

# EPFL today


| | |
|---|---|
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