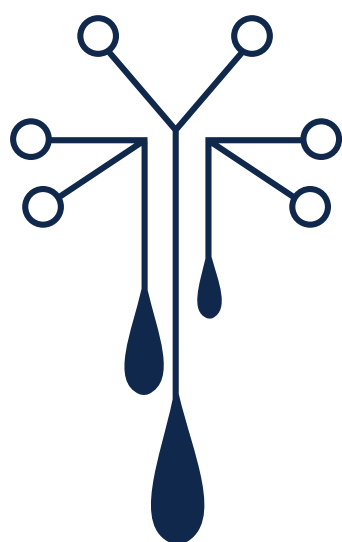


GDR

Groupement
de recherche

MNF Micro et nano
fluidique



Journées Plénières

Toulouse

23-24 septembre 2021



This is the short version of the booklet for print use.
All informations about the conference can be found at:
<https://gdrmnf2021.sciencesconf.org>

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https://github.com/maximelucas/AMCOS_booklet

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About

The MicroNanoFluidics GDR

Micro and nanofluidics is an emerging, dynamic field with strong development potential. The scientific community is young covering the fields of physics, process engineering, micro and nanotechnologies, (bio) chemistry and biology. This strong interdisciplinarity gives it its own identity and great strength, but in return involves an effort of exchange and communication. The Micro and Nanofluidics GDR (<https://www.gdrmicrofluidique.com>) provides a framework for exchange and dialogue, to continue the effort initiated by the CNRS for several years.

The GDR is intended to be a dynamic structure, representative of the various disciplines concerned. It is organized into 6 scientific themes, led by the GDR steering committee:

- Nanofluidics and energy
- Microfluidics for diagnostics and clinics
- Organs-on-a-chip / cell-on-chip biology
- Flow chemistry
- Wave / flow interactions
- Flow, heat and mass transfer at microscale

Its strategic objective is to bring together a multidisciplinary community, active and visible at European and international level, by bringing together actors from public research, industrial actors and associations on the objectives of animation and foresight.

Organizing committee

Paul Bruand	PhD Student	LAAS-CNRS
Morgan Delarue	Researcher	LAAS-CNRS
T�rence Desclaux	PhD Student	IMFT & LAAS-CNRS
Pierre Joseph	Researcher	LAAS-CNRS
Olivier Liot	Associate Professor	IMFT

Scientific committee

Anne-Laure Biance	ILM	Lyon
Morgan Delarue	LAAS-CNRS	Toulouse
St�phanie Descroix	Institut Curie	Paris
Pierre Joseph	LAAS-CNRS	Toulouse
Christine Lafforgue-Baldas	TBI	Toulouse
Sylvie Lorthois	IMFT	Toulouse
Olivier Liot	IMFT	Toulouse
Karla Perez Toralla	CEA	Saclay

Schedule

AW: Award Winner, **CT**: Contributive Talk, **IS**: Invited Speaker, **SP**: Sponsor Presentation.

Thursday, 23 of September

8:00–8:45		Registration	
8:45–9:00		Welcome remarks	
9:00–9:40	IS	Fabien Montel Lab. Phys. ENS de Lyon, Lyon	Transport through biomimetic nanopores : directionality and selectivity
9:40–10:00	AW	Claire Amadio-Dessalles Ladhyx, Palaiseau	Flow-actuation generates shear and strain in a microvessel-on-chip
10:00–10:20	CT	Paul Cochard-Marchewka LCMD, Paris	Droplet-based microfluidic platform for viscosity measurement over extended concentration range
10:20–10:40	CT	Roudy Al Sahely IEMN, Lille	Advanced cell manipulation with vortex-based acoustical tweezers
10:40–10:45	SP	Florestan Roume	Oxxius
10:45–10:50	SP	Michel Bouriau	Microlight 3D
10:50–11:20		Coffee break - Offered by the Région Occitanie	
11:20–11:40	AW	Lucile Alexandre IPGG, Paris	Integrated microfluidics platform for evs detection and characterization: how to dissect their heterogeneity?
11:40–12:00	CT	Jean Comtet SIMM, Paris	Direct observation of water mediated single proton transport between hBN surface defects
12:00–12:20	CT	Gabriel Ramos-Peroni IMFT, Toulouse	Biofilm growth profile in porous media subjected to flow and UV-C light
12:20–12:40	CT	Zacchari Ben Meriem LAAS-CNRS, Toulouse	Towards complete mechano-chemical control in tumor-on-a-chip
12:40–12:45	SP	Geoffroy Holfsbeek	LiveDrop
12:45–12:50	SP	Paul Coudray	Kloé
12:50–14:50		Lunch and posters (odd numbers)	
14:50–15:30	IS	Christophe Marquette ICBMS, Lyon	Bioprinting and 3D-printing
15:30–15:50	AW	Nikita Kavokine LPS, Paris	Quantum friction in nanoscale water flows
15:50–16:10	CT	Karla Perez-Toralla CEA Saclay, Saclay	Microfluidic bead-based immunoassay for quantification of antibiotic resistance in enterobacteriaceae
16:10–16:30	CT	Valentin Laplaud Ladhyx, Palaiseau	Parallelized plant morphogenesis in a controlled microfluidic environnement.

16:30–16:35	SP	Guillaume Laffite	Klearia
16:35–16:40	SP	Nour Yakdi	Fluigent
16:40–17:10	Coffee break		
17:10–17:30	AW	Afshin Abrishamkar McMaster University, Hamilton (Canada)	Continuous-flow microfluidics provides a robust platform for controlled production of conventionally-unachievable species of advanced materials
17:30–17:50	CT	Cyril Picard LIPhy, Grenoble	Dynamical wetting and drying in ultra-hydrophobic hybrid nanopores
17:50–18:10	CT	Thomas Delahaye Pasteur, Paris	Elaboration of electrochemical detection strategies to perform titrations in droplet microfluidics
18:10–18:30	CT	Charles Moore Ladhyx, Palaiseau	Measuring young's modulus of soft gels in a planar microfluidic device via simple clogging
19:45–23:00	Gala dinner at La Brasserie des Beaux Arts		

Friday, 24 of September

9:00–9:20	AW	Hugo Chesneau LOMA, Bordeaux	Numerical investigation of optical and acoustical deformation of soft fluid-fluid interfaces.
9:20–9:40	CT	Youness Soumane LRP, Grenoble	Clogging of a 2d model porous media by a suspension
9:40–10:00	CT	Yoav Green Ben-Gurion University of the Negev, Tel-Aviv (Israël)	Nanopore conductance: geometry and surface charge-regulation
10:00–10:20	CT	Malèke Mouelhi ILM, Lyon	A multi-confiner system to decipher the effect of long-term compression on cancer cells
10:20–10:25	SP	Sébastien Cargou	Elvesys
10:25–10:30	SP	Roberta Menezes	Eden Tech
10:30–11:00	Coffee break		
11:00–11:20	CT	Léa Pinon Institut Curie, Paris	Emulsion droplets and microfluidic traps to study the B cell polarization and its mechanics
11:20–11:40	CT	Marie-Caroline Jullien IPR, Rennes	Effect of local heating on two-phase microfluidics
11:40–12:00	CT	Théo Aspert IGMBC, Strasbourg	Tracking aging and environmental adaptation of single-cells with microfluidics, timelapse microscopy and deep-learning
12:00–12:20	CT	Ludovic Keiser LIPhy	Jerky dynamics of biomimetic leaves drying
12:20–14:20	Lunch and posters (even numbers)		
14:20–15:00	IS	Anke Lindner PMMH-ESPCI, Paris	Steering microscopic particles in viscous flows via shape and deformability

15:00–15:20	AW	Fan Zhang ICMCB & I2M, Bordeaux	Supercritical Antisolvent Process Intensification through the Use of High Pressure Microfluidic Mixing
15:20–15:40	CT	Fatima Flores-Galicia C2N, Paris	Predicting ion concentration polarization in short nanochannel
15:40–16:00	CT	Victor Fournié LAAS-CNRS, Toulouse	Opto-fluidic 3d printing platform for micro-environment and tissue engineering
16:00	Closing remarks – End of the conference		

All abstracts including full author list and references can be reached by clicking on the talk title (online version).

They can also be found at:

<https://gdrmf2021.sciencesconf.org/browse/search>

or by flashing this QR-code :



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Transient behavior of temperature-driven flows in microtubes: experimental and numerical comparison Dingdong Zhang – <i>ICA, Toulouse</i>	5
Ionic transport in subnanometric-thick films Aymeric Allemand – <i>ILM, Lyon</i>	7
Transport of non-spherical particles in square microchannel flows Tohme Tohme – <i>ICA, Toulouse</i>	9
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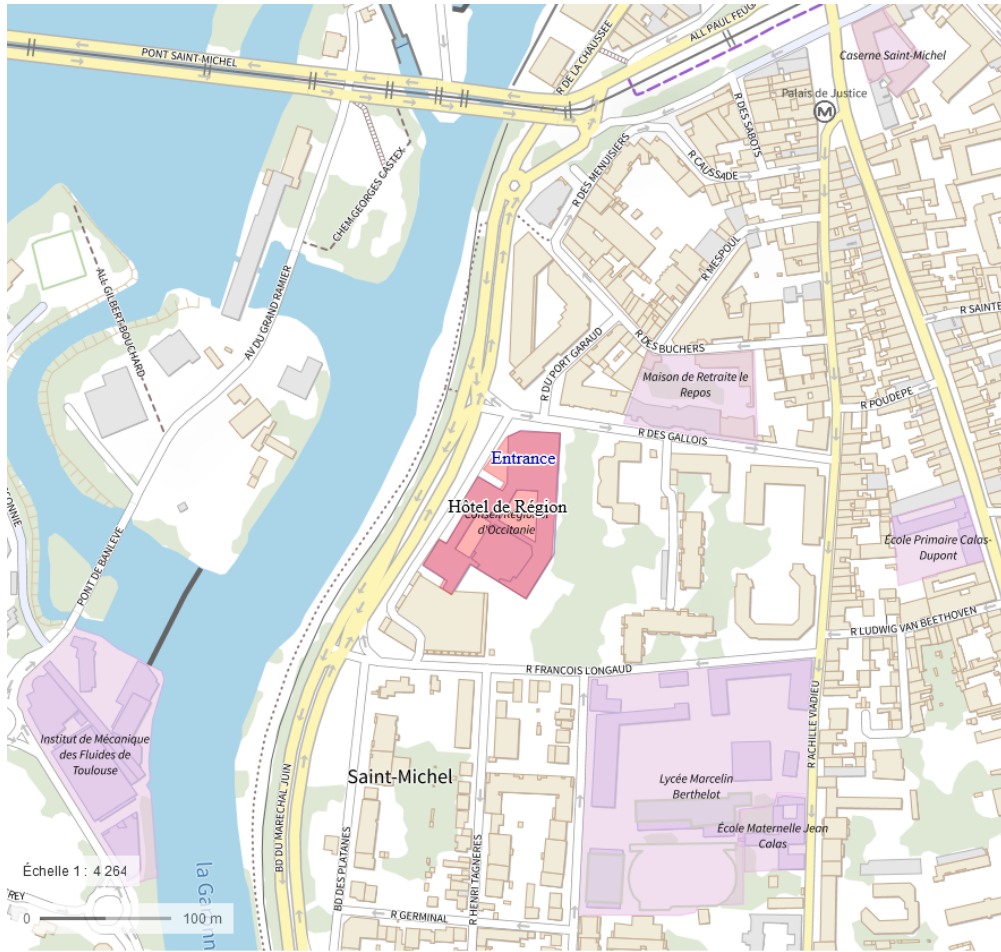
Useful Information

If sanitary conditions permit, presentations will take place in the Hôtel de Région, located at 22, boulevard du Maréchal-Juin. Entrance will be at the northern part of the Hôtel de Région, located at the corner of "rue des Galois" and "Boulevard du Marechal Juin". (see map and photograph below). The gala dinner will be held at the "Brasserie des Beaux Art", 1 Quai de la Daurade, Toulouse

How to get to the Hôtel de Région?

- **By public transport:** The Toulouse public transport network is operated by Tisseo. The Hôtel de Région is served directly by a bus line (L9) - Conseil Régional stop, and it is located 600 meters away from the Palais de Justice stop, which serves metro B and tram T1 and T2. Note that the airport is served by the tram (accessible at the normal price - 1.70 € the trip) and by a shuttle (it is accessible at the rate of 8 € per trip / € 35 for a book of 6 tickets).
- **By bike:** A self-service bicycle service (VélÔToulouse) exists throughout the metropolitan area of Toulouse. A station is also located rue des Galois, in the direct vicinity of the Hôtel de Région.
- **By car:** The Hôtel de Région is accessible by car. If you plan to park in the street, please note that the Hôtel de Région is located at the border of the "Faubourg" zone, in which long-term parking (+ 5h) is prohibited from 9h to 19h. More informations are available on the Toulouse Metropole website.

The nearest public (paying) car park is the "Parking Toulouse St-Michel", located 600 meters away from the Hôtel de Région.



< Données cartographiques : © IGN > +



Gala dinner

You are invited to a gala dinner on **Thursday 23 September** at *Brasserie Les Beaux-Arts* (1 Quai de la Daurade). We ask you to come between 7:30 pm and 8 pm.

To get to the restaurant from Hôtel de région, you can walk along the banks of the Garonne (17 min) or take the L9 bus line (from *Conseil Régional* stop to *Pont Neuf* stop). See map below.

Please make sure to bring your **badge** and the **colour card** indicating your chosen main dish.





BRASSERIE
LES BEAUX-ARTS

MENU GDR MNF
Dîner du 23 Septembre 2021

Gaspacho du moment

~~~~~

Saumon cuit à la plancha, quinoa bio à l'orange, vierge de tomates  
Cuisse de canard confite, pommes grenailles persillées

~~~~~

Verrine au citron, sablé breton, chantilly et meringues

~~~~~

Vin 25cl St Lannes (blanc ou rouge)  
Eau minérale plate ou gazeuse (50cl)  
Café ou Thé



# Partner Institutions and Sponsors

## Sponsors

### Eden Tech

Eden Tech is a Parisian company providing new microfluidic solutions that revolutionize industry. We work with innovators in academia and industry to harness the potential of chip technologies at all scales.

Innovators turn to us when seeking a competitive advantage in device development, when under time pressure to achieve results quickly, when frustrated with complicated fabrication protocols and machines, and when facing limitations from non-scalable materials.

With this in mind, we offer cutting edge solutions in the form of fabrication kits. Eden Tech is growing rapidly because our solutions are unique. Our team of scientists have made sure to cover the key needs for biotech applications. Our equipment is scalable and affordable, opening up more opportunities for product development. And device fabrication is fast and easy, making microfluidics accessible to a wider audience.

Our key solutions include Flexdym the biocompatible polymer, and the Sublym user-friendly hot press. Visit our stand to see them for yourselves!



### Elvesys



ELVESYS is an innovative, self-funded company created by 3 microfluidic researchers who started to develop microfluidic instruments in 2011. Microfluidics can be integrated in a variety of applications, scaling up experiments and adding accuracy and repeatability to each step. Today, our instrument brand ELVEFLOW is the world leader of high-performance microfluidic flow

control. The main mission of the company is to provide state-of-the-art instruments to scientists to help them achieve major advances in their research field. The second mission is to facilitate the access of non-specialists (chemists, biologists) to microfluidics through the development of “plug and play” all-inclusive packs dedicated to specific applications. Totaling 45 employees and 1,200m<sup>2</sup> of work space in the heart of Paris, ELVESYS has built up a team of highly qualified members with expertise in each and every field necessary to help researchers in their microfluidics research, including engineers, biologists, software engineers, and more. Today, we work in collaboration with over 60 research laboratories in Europe, mainly through international collaborative projects funded by the European Commission.

## Fluigent



Fluigent is the global leader in providing fluid handling solutions for scientific & industrial research and a wide range of applications (diagnostic, vaccine, point of care, food) where fluid control is critical.

Since its foundation, Fluigent has committed to set up the standards and to make progress in Microfluidics. More than 6 000 Microfluidics systems with the certifi-

cation ISO 9001 have been employed by our customers in 50 countries around the world.

For 15 years, Fluigent has strived to stay in the forefront of science. Our most innovative solutions facilitate and improve the work of worldwide R&D researchers. In 2020, Fluigent's microfluidic solutions saved 25,470 hours globally for R&D researchers.

## Klearia

Entreprise Deeptech issue du CNRS (LPN) et créée en 2012, la société KLEARIA est une PME française qui est spécialisée dans la conception, la fabrication et l'intégration sur mesure de technologies microfluidiques et de Lab-on-Chips en verre.



A travers sa fonderie microfluidique et son bureau d'étude LabInGlass™, bénéficiez de l'expérience et du savoir-faire de son équipe pluridisciplinaire. Nous vous vous accompagnerons pour donner vie à vos idées à tous les niveaux de maturité de votre projet. D'une étude préliminaire au partenariat académique, de la production de petites et moyennes séries de puces microfluidiques, et de l'intégration de modules spécifiques jusqu'au développement d'un instrument Ad-hoc.

Soucieuse de répondre aux enjeux de développement durable, la société Klearia est fière d'avoir été reconnue et labélisée par la prestigieuse Solar Impulse Foundation en 2021 pour sa gamme d'analyseurs commerciaux PANDa™ dédiée au monitoring des micropolluants dans l'eau.

## Kloé



15 years ago, Kloé made the bet of development of microfluidics. For this reason we've developed equipments dedicated to microfluidic chip fabrication to answer the specific needs of microfluidics community; like the capability to proceed thick resist layers with perfect vertical sidewalls and low surface roughness, no need for cleanroom environment, user-friendly for people

not familiarized with microtechnology, and compact, robust and low cost equipment. Now, we are pleased to offer a complete range composed with more than 10 equipments like masking systems and mask aligners in UV KUB range, Direct laser writers from Dilase range and high resolution 3D printer Dilase 3D. Today more than 70% of this GDR's speakers come from laboratories or institutes that are equipped with at least one Kloé system. We wish to thank all of them for their confidence in our technology and invite the other to visit us to define together the right system to achieve their fabrication goals in microfluidics.

## LiveDrop

Unleash the power of droplet microfluidics and single-cell analysis with ModaFlow™

At LiveDrop, we have developed ModaFlow™, the first all-in-one instrument that provides an instant access to the droplet microfluidics technology.

ModaFlow™ robustly integrates optics, camera, laser and fluorescence detector, high precision pressure regulators, pneumatic valves and software, in a single instrument. It comes along with consumable microfluidic chips and our patented smart interconnection system. ModaFlow™ is versatile and allows for a variety of workflows, from simple droplet production to single-cell encapsulation, lysis, droplet manipulation with valves, fluorescence screening and sorting.

ModaFlow™ enables the process of individual cells at high throughput up to 1M cells/day, with preserved viability. It is particularly well adapted to high-throughput single-cell encapsulation of rare, sensitive or high-added value cells and products.

Get your ModaFlow™ and start your droplet experiment in less than five minutes while saving precious time to focus on your biological application.

With almost 10 years of experience in droplet microfluidics, LiveDrop is committed to make droplet microfluidics easy and accessible to life science researchers.



## Microlight 3D



demain. Les équipements de Microlight3D sont conçus pour des applications en micro-optique, en micro-fluidique, en micro-robotique, dans les méta-matériaux, la biologie cellulaire et la microélectronique. Créée en 2016, après 15 années de R&D à l'Université de Grenoble-Alpes (UGA) sur sa technologie de micro-impression 3D, Microlight3D est installée à Grenoble, dans la région Auvergne-Rhône-Alpes.

Microlight3D est un fabricant de machines de micro-impression 2D et 3D haute résolution. La société permet aux scientifiques et aux industriels qui recherchent de nouveaux outils de conception de produire des micro-pièces très complexes, dans n'importe quelle forme géométrique ou organique souhaitée, avec une finition parfaite. En combinant des techniques de micro-impression 2D et 3D, Microlight3D offre à ses clients une plus grande flexibilité pour la création de pièces complexes de plus grand format. La société entend fournir des systèmes permettant une micro-impression plus rapide et plus complexe pour les applications de

## Oxxius



ence, measurement and manufacturing markets. Oxxius also develops Wavelength combiners. The L6Cc and L4Cc are the most compact and flexible all-in-on multicolor laser sources, with up to 7 lasers lines and delivery up to 4 optical fiber outputs.

Oxxius develops and manufactures **DPSS** (Diode Pumped Solid State Lasers) and **laser diodemodules** in the ultraviolet, visible and near-infrared wavelength ranges. The **LCX** series of DPSS lasers and the **LBX series** of laser diode modules provide exceptional optical performances in an ultra-compact design which can be easily integrated into various instruments for life science,

Understanding our customers' needs, we offer reduced power consumption, optical noise, size and cost while increasing power, ruggedness and reliability. They are also an invaluable tool for academic or industrial research.



## Public institutions

### Région Occitanie / Pyrénées-Méditerranée

The Occitanie / Pyrénées-Méditerranée region covers 13 departments and is home to 4,454 municipalities. The region is rich in varied landscapes and climates, in particular two massifs and more than 220 km of Mediterranean coasts.

Occitanie region is one of the biggest research places in France, especially with Toulouse and Montpellier campuses.

Occitanie region funds this conference as an important and interdisciplinary national meeting. It also provides its amphitheater to welcome us in the best conditions.



### Institut National Polytechnique de Toulouse



The INP Group brings together more than 30 engineering schools. More than 21,000 students, including 1,360 apprentices and 2,400 doctoral students. 6000 engineers graduate each year. 110 double degrees offered - 113,000 active graduates. The INP Group is developing synergies between schools for the benefit of students thanks to crossed paths.

The National Polytechnic Institute of Toulouse brings together six engineering schools whose training is strongly backed by the establishment's research laboratories. It offers a framework favorable to innovation and very open to the international market. It guarantees students quality training, a wide choice of courses adapted to the needs of companies and rapid professional integration.

### Laboratoire d'Analyse et d'Architecture des Systèmes

The Systems Analysis and Architecture Laboratory (LAAS-CNRS) is a CNRS unit attached to the Institute of Engineering and Systems Sciences (INSIS) and the Institute of Information Sciences and their interactions (INS2I). The research carried out at LAAS-CNRS aims at a fundamental understanding of complex systems while considering the use that may result from them. Conversely, many societal or industrial issues, for example in the fields of aeronautics, space, health, energy or communication networks raise fundamental questions which in turn feed the inspiration for researchers.



Thus, both a pioneer of emerging issues and a promoter of integrated solutions, the laboratory has identified 4 strategic axes based on the four disciplinary fields which have been the hallmark of the laboratory since its creation (computer science, robotics, automation and micro and nano systems).

## Institut de Mécanique des Fluides de Toulouse



Located in the heart of Toulouse on an island in the Garonne, IMFT is developing a wide range of research into the physical and chemical phenomena present in fluid flows. The fields of application are varied in Engineering Sciences (nuclear engineering, petroleum engineering, aeronautics and space, land transport, combustion and reactive media, transformation of energy and matter), the mechanics of living organisms and environmental fluid mechanics.

IMFT is a Mixed Research Unit (UMR 5502), supported by its three supervisory bodies: CNRS, Toulouse INP-ENSEEIH and Toulouse III - Paul Sabatier University.

## Institut National des Sciences Appliquées Toulouse

With more than 17,000 engineers, present in all sectors of the economy, the National Institute of Applied Sciences of Toulouse, public engineering school, multidisciplinary and international, is recognized for the excellence of its training in five years after the Baccalauréat, which attracts high-level students. INSA Toulouse offers a range of 8 specialties, from IT to Civil Engineering, including Physical Engineering and Biological Engineering. Its teaching, in connection with the most recent scientific advances, relies heavily on the activity of leading research laboratories, supported by large industrial groups, in the field of new materials for aeronautics, for example, technologies for preserving the environment or nano-objects.



## Fédération de Recherche FERMAT



The FERMAT Research Federation (Fluids, Energy, Reactors, Materials and Transfers) aims to promote the emergence, sustainability and visibility of multidisciplinary or interdisciplinary collaborative projects between project teams from nine laboratories in the Engineering field of 'Federal University of Toulouse.

Supported by three universities (INPT, INSA, UT3) and by the CNRS, it is identified as a privileged tool for carrying out lasting collaborations within Toulouse engineering on an application scope that includes health and well-being, the preservation of resources and of the environment, the development of energies with low environmental impact, the development of advanced and active systems and materials, technologies and the production of goods.

