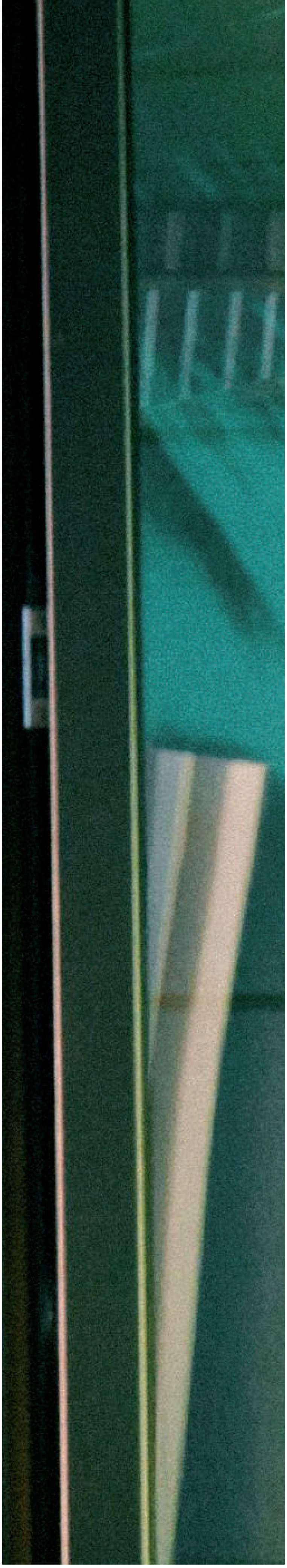


1976 - 2026
anniversary

Laboratoire
Hubert Curien
UMR ▪ CNRS ▪ 5516 ▪ Saint-Étienne

The laboratory is celebrating its 50th anniversary in 2026 !
Three levels of events are planned throughout the year:
an institutional anniversary day to launch the festivities in July 2026,
a series of seminar days spread over the second part of the year,
and a public outreach day in October 2026.

celebrate with us !

50 years 1976-2026

Laboratoire Hubert Curien
UMR ▪ CNRS ▪ 5516 ▪ Saint-Étienne

our PROGRAM


anniversaire
1976 - 2026

50 years 1976-2026 Laboratoire Hubert Curien UMR ▪ CNRS ▪ 5516 ▪ Saint-Étienne

Florent Pigeon
Président de l'Université
Jean Monnet Saint-Étienne

Antoine Petit
Président-Directeur Général
du CNRS

François Royer
Directeur du
Laboratoire Hubert Curien

ont le plaisir de vous convier à

La journée de célébration des 50 ans du
Laboratoire Hubert Curien

JEUDI
9 JUILLET 2026
à 10h

Cité du Design
Espaces réceptifs de la Platine,
3, rue Javelin Pagnon
42000 Saint-Étienne

Dans le cadre de cet évènement,
nous aurons le plaisir de vous proposer une

Conférence par le Professeur Hugo Thienpont
(Vrije Universiteit Brussel - VUB), à 14h, sur inscription :
«*Key-Enabling Technology to Accelerate Innovation for Industrial Growth in Europe*»

Eléments du programme
10h Accueil
10h30 Prises de paroles et témoignages
12h30 Buffet
13h30 Présentation des axes de recherche
14h-15h30 Conférence du Prof.Hugo Thienpont

Nous vous remercions par avance de bien vouloir confirmer votre présence à la journée de célébration avant le Lundi 29 Juin 2026.

Université Jean Monnet Saint-Étienne
cnrs

Launch Day Celebrations

A full day of events featuring speeches, testimonials, presentations, and a keynote lecture by:

Professor Hugo Thienpont
(Vrije Universiteit Brussel - VUB):
«Key-Enabling Technology to Accelerate Innovation for Industrial Growth in Europe»

Science Festival

An afternoon of demonstrations and activities for younger audiences, including a special session for UJM staff families, followed by presentations for the general public

Seminar Series

7 thematic seminars for the scientific community, featuring presentations by our teams and an invited lecture

Laboratoire Hubert Curien
UMR • CNRS • 5516 • Saint-Étienne
50 years 1976-2026

# of CELEBRATIONS

An event sponsored by :

Université Jean Monnet Saint-Étienne
SAINT-ÉTIENNE la métropole
cnrs
INSTITUT d'OPTIQUE GRADUATE SCHOOL ParisTech

Programme Highlights

10:00 - Welcome
10:30 - Speeches and testimonials
12:30 - Buffet lunch
13:30 - Presentation of research themes
14:00 to 15:30 - Lecture by Prof. Hugo Thienpont

By invitation only

Cité du Design
Espaces réceptifs de la Platine
3, rue Javelin Pagnon
42000 Saint-Étienne

THURSDAY 9th JULY 2026 - 10am

Registration required
The lectures will be available on line

Bâtiment des Forges
Université Jean Monnet
11 Rue Dr Rémy Annino
42000 Saint-Étienne

THURSDAY 1st OCTOBER 2026 - 2pm

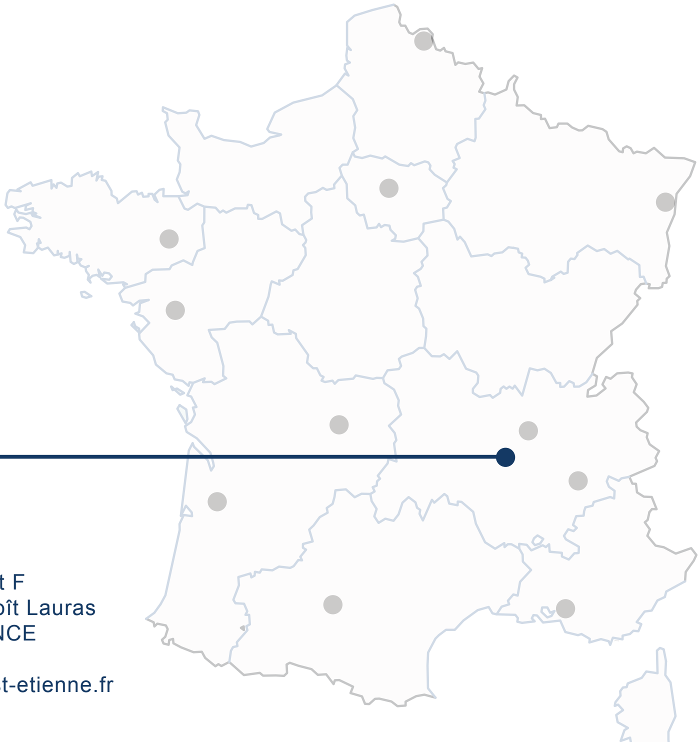
Registration required
The lectures will be available on line

Bâtiment des Forges
Université Jean Monnet
11 Rue Dr Rémy Annino
42000 Saint-Étienne

SEPT. to DEC. 2026 - 1:30pm

LOCATION

The Hubert Curien Laboratory is a joint research unit of the Université Jean Monnet Saint-Étienne and CNRS, with the Institut d'Optique Graduate School as secondary institutional sponsor. It is located in Saint-Étienne, the 2nd largest city of the Auvergne - Rhône - Alpes Region, in an environment particularly favourable to the development of its research and innovative activities.

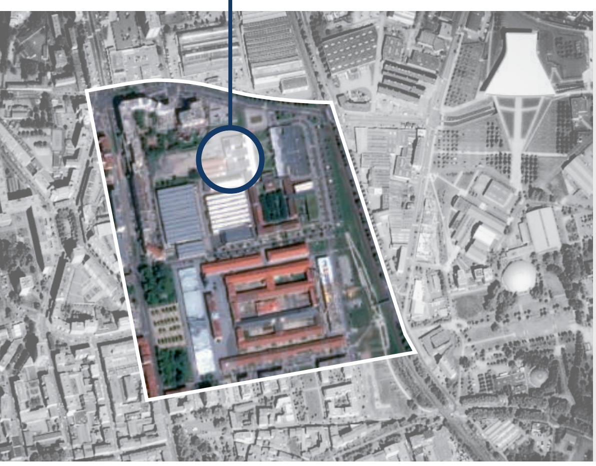


cartographie : **www.comersis.com**

Université Jean Monnet Saint-Étienne

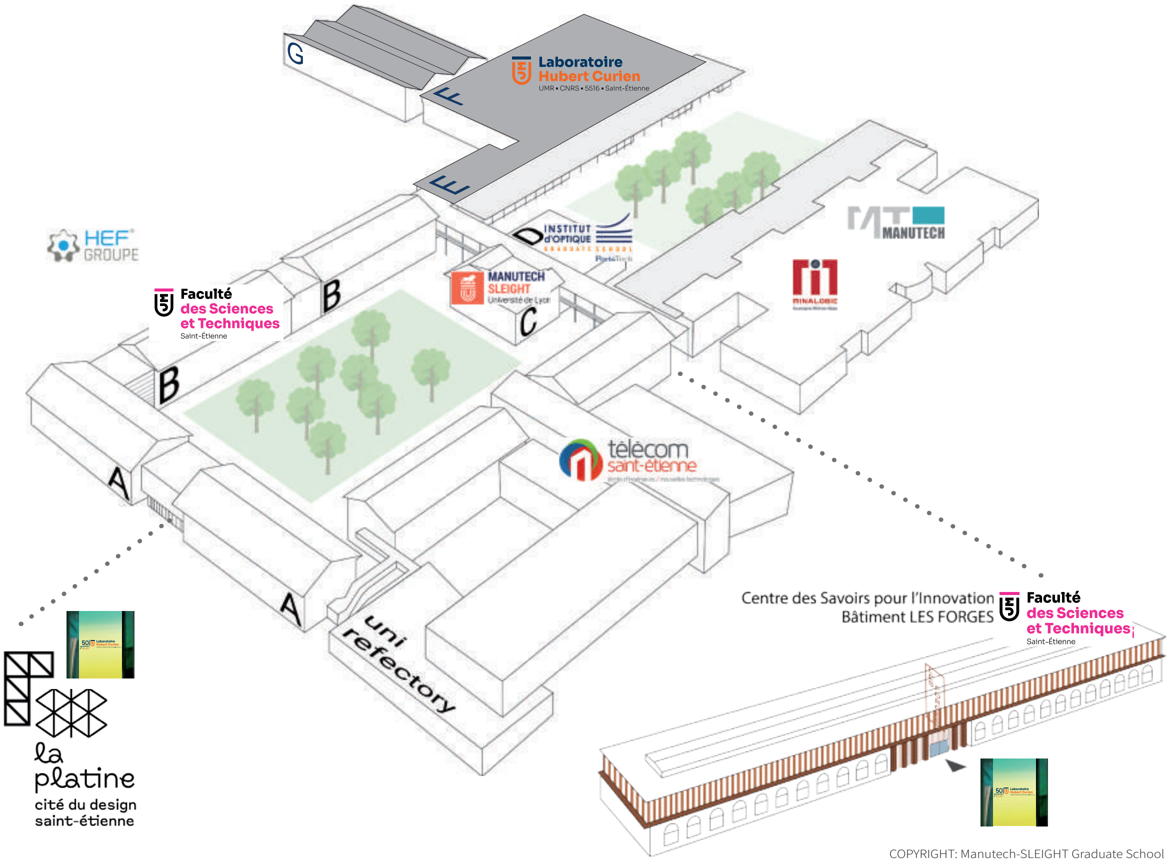
Laboratoire Hubert Curien
UMR • CNRS • 5516 • Saint-Étienne

Laboratoire Hubert Curien
UMR CNRS 5516, Bâtiment F
18 Rue du Professeur Benoît Lauras
42000 Saint-Étienne, FRANCE
Tel : +33 (0)4 77 91 57 80
email : lab.h.curien@univ-st-etienne.fr



Manufacture Campus aerial view
(Imagery ©2023 CNES / Airbus, Maxar Technologies, Map data ©2023)

The Hubert Curien Laboratory is situated at the heart of the «Manufacture Campus», established on the historic site of the former Saint-Étienne's arms factory. The lab benefits from exceptional surroundings including cultural, industrial, educational and research activities, as well as housing, sport and leisure facilities.

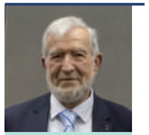


COPYRIGHT: Manutech-SLEIGHT Graduate School

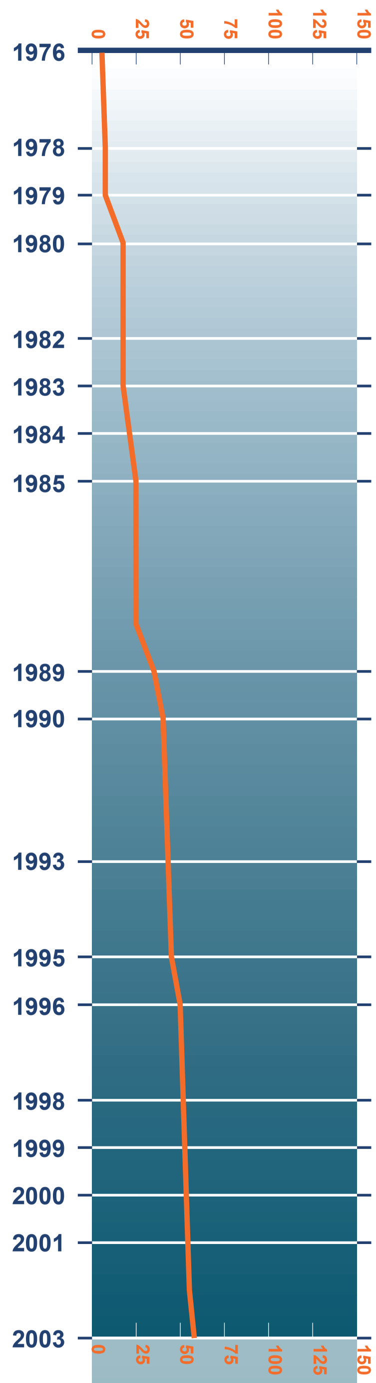
The Manufacture Campus houses the university's Faculty of Science & Technology, its Physics & Computer Science departments and its «Télécom Saint-Étienne» engineering school. In 2003, it was selected by the Institut Optique Graduate School to set up a branch outside Paris. Minalogic, a local industrial «competivity cluster» occupies the site, as well as the Economic Interest Group GIE Manutech USD. The company HEF R&D (surface engineering and micro/nanostructuring) has established its premises on the site, reinforcing the status of the Manufacture Campus as an emblem of an ecosystem that closely links the university and the business world.

TIMELINE

Year	Key events	Directors	Research	Innovation
1976	**Laboratory foundation** with UJM affiliation (Université Jean Monnet Saint-Étienne)	Jean-Noël MASSOT	Guided Optics, Optical Instrumentation, Optical Fibers	
1978	**Installation in Saint-Étienne** (Métare Campus)		+ Signal Processing	
1979				
1980				
1982	CNRS association		+ Optical Materials	
1983			+ Image Processing	
1984	**New building** (Métare Campus)			
1985		Jean-Pierre GOURE	+ Optical & EM Modeling	
1989	**New building** (Métare Campus)		+ Spectroscopy + Biological & Medical Engineering	
1990				
1993	**New building extension** (Inaugurated by Hubert Curien & Georges Charpak)			
1995	UMR CNRS creation		+ Optical Fiber Sensors	
1996		Alain CACHARD	+ Diffraction Gratings	
1998			+ Optoelectronics + Vision	
1999		Pierre LAPORTE		Pôle Opique et Vision & technology platforms
2000			+ Femtosecond Laser Technologies	
2001			+ Photosensitivity	
2003	**New building** (Manufacture Campus)		+ Surface Engineering + Micro-nano Structuring + Light-Matter Interaction	



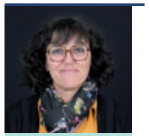
Permanent Staff Numbers

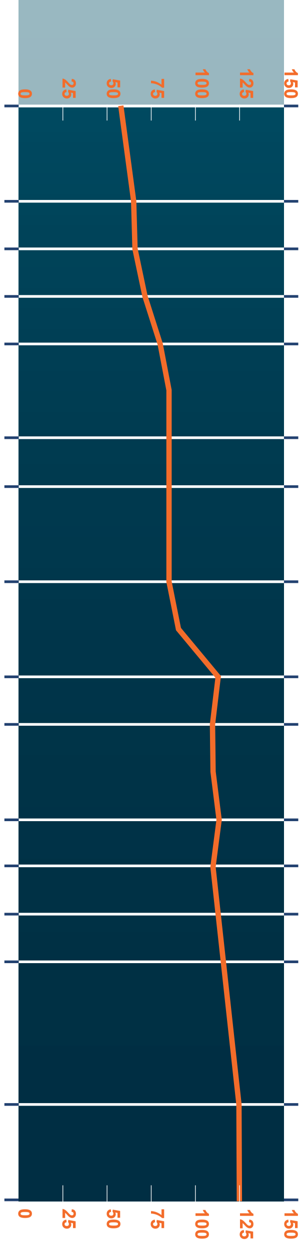


Laboratory logos

……1976 to 2026

Year	Events	Director	Research / Partnerships
2003	New building (Manufacture Campus)	Pierre LAPORTE	+ Surface Engineering + Micro-nano Structuring + Light-Matter Interaction
2005			+ Hardware Security
2006	EURISE lab fusion (UJM)		+ Machine Learning & Data Mining
2007	TSI becomes *Laboratoire Hubert Curien*		+ Colour
2008	LIGIV lab fusion (UJM)	Florent PIGEON	+ Lighting, Visual Rendering, Opto-numerical Security
2010			+ Embedded Systems Security
2011			Labex Manutech-SISE
			Equipex Manutech-USD
2013			GIE Manutech-USD
2015	LT2C + ISCOD (École des Mines) labs fusion		+ Micowaves, Magnetic Materials
2016	IOGS secondary affiliation	Florence GARRELIE	+ Photonics in Extreme Radiative Environments
2018	Manutech-SLEIGHT Graduate School		LabH6 Joint lab (IxBlue/Exail)
2019			GDR CNRS Appamat (Materials Appearance)
2020			
2021			LAMCID Joint lab (HID/Toppan Security)
2024	Inria team MALICE foundation		+ Physics-Informed ML COMETA Joint lab (HEF Groupe) OPERA Joint lab (Orano)
2026		François ROYER	



Laboratoire Hubert Curien
UMR • CNRS • 5516 • Saint-Étienne
50 years 1976-2026

OUR ACTIVITIES
at a glance

Training

9 **Master tracks** coordinated by researchers from the lab

incl. **4** new Master **Erasmus Mundus**

incl. **6** **international tracks**

Manutech-SLEIGHT **Graduate School coordination**

~ **80 interns** hosted every year (~60 % Master students)

Manutech-SISE **Labex coordination**

Involved in PRIMES & MILyon **Labex**

GDR CNRS Appamat coordination (renewed)

Research

4 **IUF** members

involved in **5** **PEPR** with **7** **financed projects**

776 papers of which **589** in peer-reviewed international journals + **187** CORE confs

44% in **international collaboration** (12,5% USA, 5% Canada, 67% Europe)

+4M€ **self-generated ressources** in 2024

4 **Programmes d'Investissement d'Avenir** of which **1** **coordinated by the lab**

18 **european projects** incl. **1** H2020 **coordinated by the lab** + **2** EIC FetProAct & PathFinder projects

4 **Technology platforms**

68 **CIFRE thesis** or equivalent **industrial thesis**

47 **ANR projects** incl. **22** projects coordinated by the lab

8 other **international grants**

Innovation

37 **Patents** (filed or published)

incl. **5** **new patents filed in 2024**

incl. **32** **patents with international extensions**

98 **Industrial contracts**

4 **Joint Laboratories** With: Exail, Toppan Security, HEF, ORANO

Several **Innovation projects** incl. **8** FUI projects, **3** **iDémo** projects, **3** **BPI** Plan de Relance projects

4 **Startups founded**

KEY FIGURES
2019 to 2024
(HCERES evaluation period)

KEY FIGURES

year 2025

127 permanent staff members

98 researchers

29 engineers, technicians & admin

115 PhD students

33 Post-docs

involved in **8** partnerships of the Lyon/St-Étienne ecosystem and **1** Institut Carnot

MANUTECH SLEIGHT Université de Lyon
LABEX MILYON UNIVERSITÉ DE LYON
LABEX PRIMES UNIVERSITÉ DE LYON
LABEX MANUTECH-SISE UNIVERSITÉ DE LYON

FRANCE 2030
CYBER SECURITY
QUANTUM TECHNO-LOGIES
ELEC-TRONICS
ORIGINS
LUMA

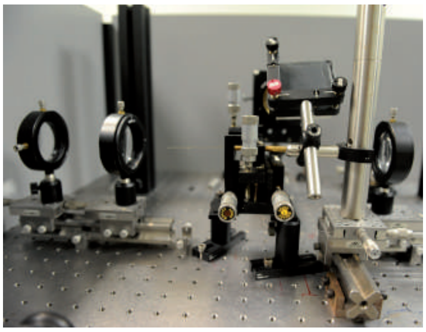
implication in **5** PEPR

4 industrial joint labs

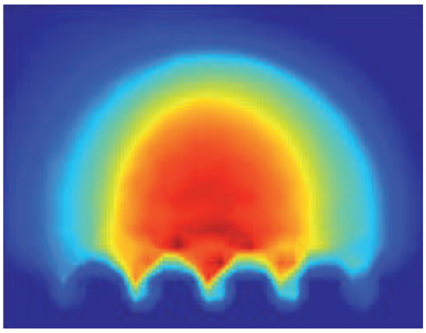
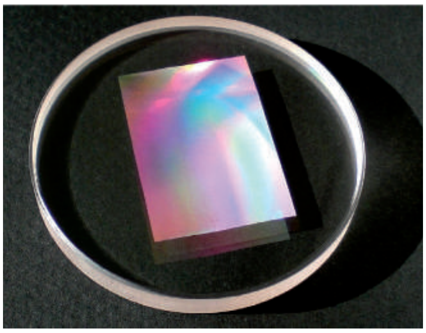
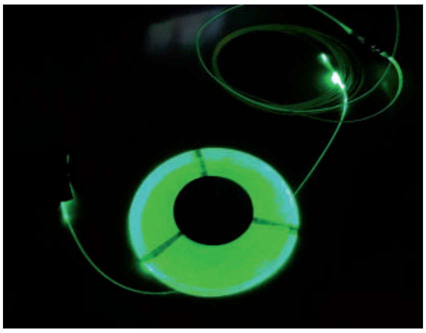
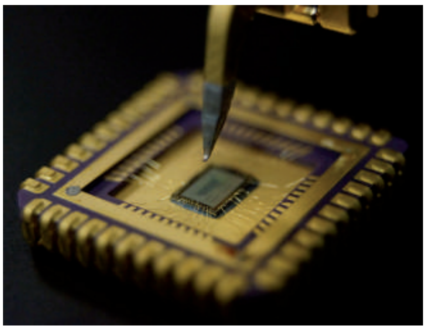
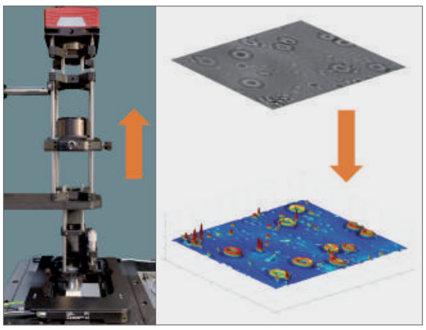
6 startups originated from or affiliated with the lab since 2011

OUR RESEARCH
themes

7 research teams



The lab covers a spectrum of research activities structured around 2 scientific departments: «Optics, Photonics, Surfaces» and «AI, Security, Image».
Our main expertise lies in Surface engineering, 2D & 3D materials' micro/nano structuring, Ultrafast laser processing, Electromagnetic modelling, Photonic materials and devices in harsh environments, Machine learning, Complex data analysis, Unconventional imaging, Computer vision, Material appearance and Hardware security. Many research projects at the interface of these disciplines lead to innovations and scientific breakthroughs.


OPTICS, PHOTONICS, SURFACES DEPARTMENT

MSF

> Functional Materials & Surfaces (MSF)

Micro-nanostructuring, Laser-nanoparticle interaction, Photonic/electromagnetic devices, Nanocomposite functional materials, Color & control of visual appearance, Thin film elaboration by sol-gel processes, Magneto-optical devices, HF/RF integrated components, Resonant grating, Plasmonics(SPR), Metasurfaces, Transition metal nitride (TiN, ZrN…)

MOPERE

> Materials for Optics & Photonics in Extreme Radiation Environments (MOPERE)

Ionizing radiations, Optical fibers & fiber sensors, Photonic & opto-electronic technologies, Materials for photonics, Monte Carlo simulations, Dosimetry, Point defects spectroscopies

PREDICT

> Photoinduced Reactive Dynamics in Computational Theory (PREDICT)

Numerical simulation, Multiscale & multiphysics modeling, Nonequilibrium dynamics, Advanced photonics, Materials response to photoexcitation, Materials & surfaces design

ILM

> Laser Matter Interaction (ILM)

Ultrafast photophysical & photochemical laser processes, Smart laser manufacturing, Modeling of ultrafast laser interaction with matter, Laser engineering & process control, Beam engineering, Extreme scales, Plasma dynamics, Laser spectroscopy & imaging, Functional surfaces, Embedded 3D photonic systems & metasurfaces

AI, SECURITY, IMAGE DEPARTMENT

IMAGE

> Image Science & Computer Vision (IMAGE)

Material appearance, Optical design, Microscopy, Unconventional imaging, Image reconstruction inverse problems, Image/video analysis and understanding, Deep learning, Interpretable/explainable models algorithm implementation, Federated learning

ML

> Machine learning (ML)

Learning theory, Ethical AI, ML for science, Physics-informed ML, Generalization & robustness, Alignment & fairness, Multimodality graphs/text/image/vector, Generative models, LLMs, Missing data and uncertainty, Federated learning, Interpretability (XAI), Optimization, Frugal AI

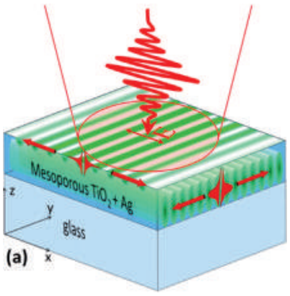
SESAM

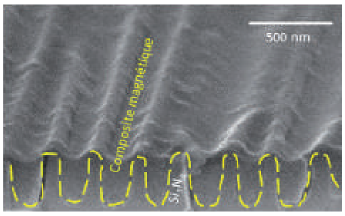
> Secure Embedded Systems & Hardware Architectures (SESAM)

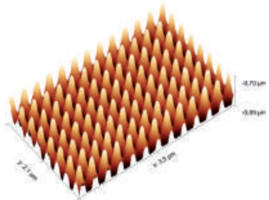
Hardware security, Secure-by-design heterogeneous SoC, Random number generation in logic devices (TRNG & PUF), Post-quantum cryptography, Security of embedded AI

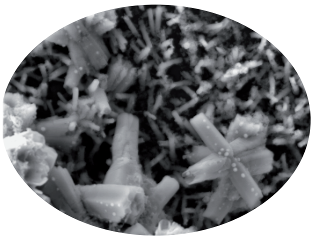
the MSF team

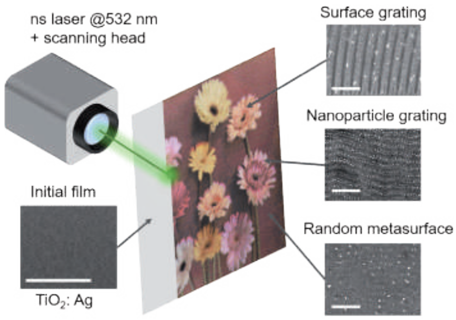
Functional Materials & Surfaces





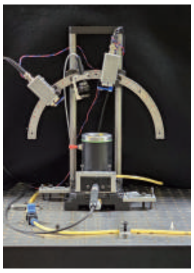


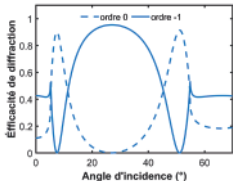


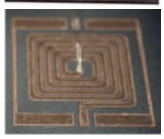


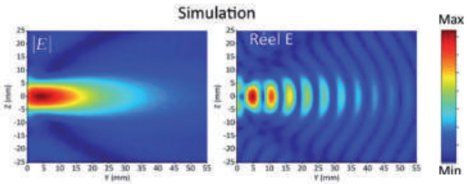
Permanent team members:

Jean-Philippe Banon
Bernard Bayard
Marie-Françoise Blanc-Mignon
Stéphane Capraro
Jean-Pierre Chatelon
Nicolas Crespo-Monteiro
Yuliya Dadoenkova
Maxime Darnon
Nathalie Destouches
Christophe Donnet
Emilie Gamet
François Goutaland
Christophe Hubert
Tatiana E. Itina
Damien Jamon
Yves Jourlin
Victor Kalt
Emmanuel Marin
Nadège Ollier
Olivier Parriaux
David Pietroy
Stéphane Robert
Jean-Jacques Rousseau
François Royer
Maxime Royon
Bruno Sauviac
Eric Verney
Isabelle Verrier
Didier Vincent
Francis Vocanson









MSF

Team leaders
Yves Jourlin (2019 - 2025)
Maxime Darnon (Since Jan. 2026)

The MSF team originates from the Instrumentation and Optical Microsystems (IMO) team of the TSI laboratory. The core of its historical activities lies in optics, and particularly in the control of light. Research on diffraction gratings, developed from the late 1990s - especially for high-power laser applications - has given the team strong recognition in the field of photolithography and in the fabrication of large-area diffraction gratings. Work on plasmonic nanoparticles complemented the team's activities in the early 2000s, with the development of nanoparticle localization methods that opened the way to multiplexed images with structural colors. Over the years, the team expanded its activities, first into sol-gel materials in the early 2010s, and then into the RF (high-frequency) domain and magnetic materials with the arrival of colleagues from LT2C in 2015. This research led to the development of nanocomposite materials which properties, enhanced by nanostructuring, enable exceptional quality factors.

The team's activities span from upstream to downstream, combining modeling and fabrication to conduct breakthrough research, from fundamental aspects to applications. Today, the Functional Materials and Surfaces team primarily focuses on controlling and shaping electromagnetic waves using functionalized materials and surfaces. The team's expertise covers material development (sol-gel materials, composite materials, ferrites), surface structuring (lithography, nanoimprinting, laser structuring), light-matter interaction mechanisms (diffraction, resonances, magneto-optics, plasmonics, electromagnetic jets), applications exploiting these phenomena (security, sensors, energy, etc.), as well as the associated modeling and characterization.

The team's work is organized around three main scientific themes: the development of functional materials, surface structuring, and applications.

The development of functional materials is a well-established theme within the team, relying on broad and unique expertise involving thin films derived from sol-gel or glass matrices, functionalized through doping, incorporation or growth of nanoparticles (metallic, magnetic, etc.) or molecules (e.g., luminophores), thermal treatments under specific atmospheres (e.g., nitriding), or laser functionalization (e.g., nanoparticle growth). Beyond exploiting the functional materials developed by the team, their research also aims at new functionalities (e.g., hyperthermia, photomagnetism), new synthesis methods, and new materials (e.g., phase-change materials).

Surface structuring is also central to the team's activities, with the development of methods to control surface topography across multiple scales (from macro to micro/nano), particularly through non-conventional lithography processes (interference lithography, nanoimprinting, colloidal lithography). These structuring methods, developed with an integrative approach (compatible with large areas and low temperatures) for components, open new ways to control and exploit electromagnetic waves.

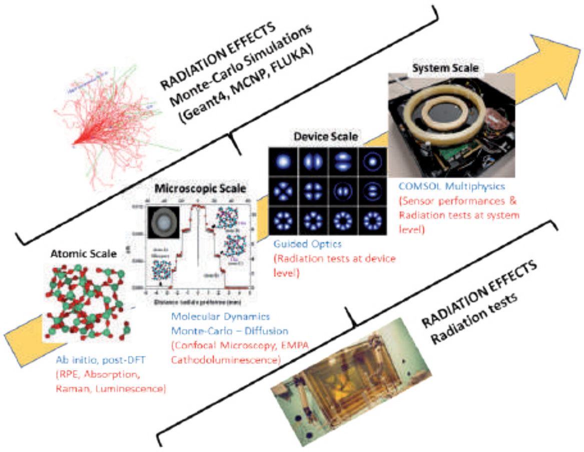
The team can rely on the NanoSaintÉtienne platform for its technological developments (platform labelled Renatech+ and CNRS in 2019), as well as on the electron microscopy platform *(see p.31)**. Both are open-access facilities available to external users.*

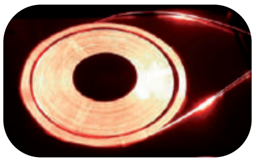
Finally, the team bridges fundamental and applied research to leverage its findings for applications based on extreme resonances (e.g., dielectric switches, bound states in the continuum) and on correlations between surface structuring, functionalization, and electromagnetic responses. These applications target various fields such as security (e.g., multiplexed images), sensors (e.g., electromagnetic jets, PFAS detection), and optical and magneto-optical metasurfaces.

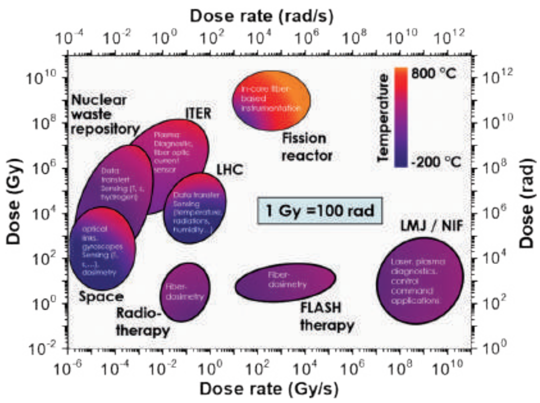
the MOPERE team

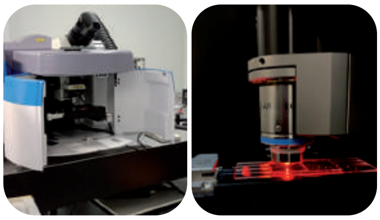
Materials for Optics and Photonics in Extreme Radiation Environments

© NASA / ESA / CNES

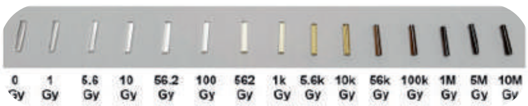








Permanent team members:
Hugo Boiron
Aziz Boukenter
Maxime Darnon
Matteo Ferrari
Sylvain Girard
Emmanuel Marin
Adriana Morana
Youcef Ouerdane



MOPERE

Team leader
Sylvain Girard (Since 2020)

The MOPERE research team (Materials for Optics and Photonics in Extreme Radiation Environments) has developed, since its creation, a scientific activity focused on understanding and controlling the effects of harsh environments, especially radiation environments, on optical and photonic materials, components and systems. It builds on the historical expertise of its members in optical materials, optical fibers and fiber-based sensors.

Its positioning relies on a close connection between fundamental research and applications, enabled by the CESARE approach, developed within the team. This multi-scale methodology combines experiments and simulations to identify the physical mechanisms responsible for radiation-induced degradation, whether related to ionization processes or atomic displacements. This knowledge is then used to design robust photonic solutions adapted to complex environments involving constraints such as temperature, pressure or chemical atmosphere.

MOPERE's activities are structured around several major research axes. The first focuses on fundamental mechanisms affecting glasses and optical fibers, with major contributions to the understanding of induced defects and their evolution kinetics. The second axis addresses the development of optical fibers and fiber sensors for extreme environments, especially for nuclear, aerospace, high-energy physics and fusion applications. The third, rapidly growing axis concerns optical dosimetry and beam instrumentation, relying on phenomena such as radiation-induced attenuation or radioluminescence. Finally, the team is extending its expertise toward emerging photonic technologies including silicon photonics, radiophotoluminescent glasses and advanced optoelectronic devices.

During the recent period, MOPERE has experienced strong growth in both scientific output and visibility. With more than 130 recent publications in international journals and a strong presence at major conferences in the field, the team has established itself as a leading player at national and international levels. This visibility also relies on a dense collaboration network involving major research organizations, space agencies, industrial partners and large-scale infrastructures. Long-term partnerships, notably through the joint laboratories LabH6 with Exail and OPERA with ORANO, provide access to unique experimental resources and enable the team to address complex applied challenges.

Among its key achievements, several advances illustrate MOPERE's ability to cover the full value chain, from material to system. The team has contributed to the development of radiation-hardened optical fibers deployed in major research facilities, as well as distributed sensors for monitoring nuclear infrastructures. In the space field, the LUMINA project led to the design and operation of an onboard optical dosimeter aboard the International Space Station.

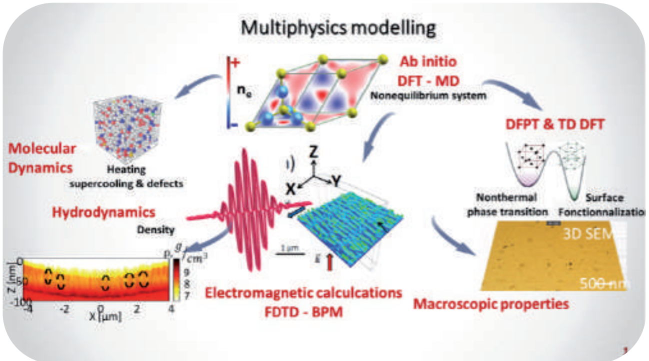
The deployment of distributed dosimetry systems in particle accelerators and embedded sensing solutions for drones also demonstrates the technological maturity reached. These successes are accompanied by significant academic recognition and a strong capacity for attraction and training, notably through the international master program RADMEP, renewed as RADMEP+ in 2025.

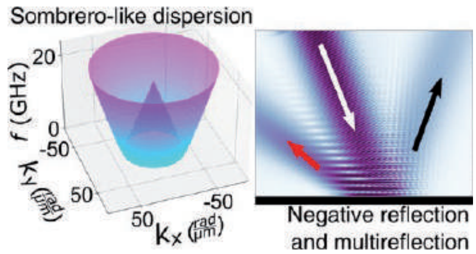
Building on these achievements, MOPERE is looking to the future with clear and structured ambitions. The team aims to consolidate its historical activities while expanding toward new technologies and scientific challenges, particularly in integrated photonics and innovative materials. Strengthening approaches combining simulation and experimentation remains a priority. In a context marked by renewed nuclear programs, the growth of space applications and increasing needs for advanced instrumentation, MOPERE aims to remain a key player in the field.

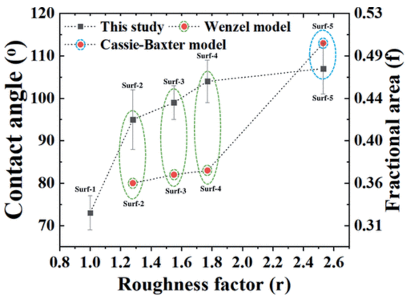
The team relies on the PETRA platform (see p.31), which it helps develop, and which offers access to external users.

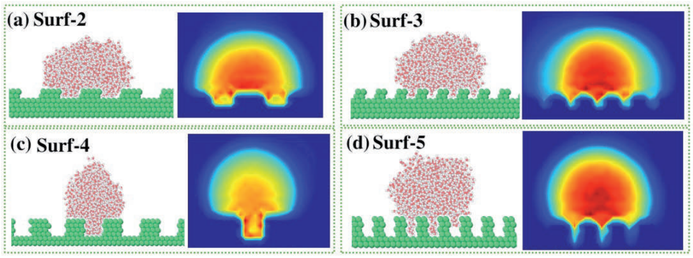
the PREDICT team

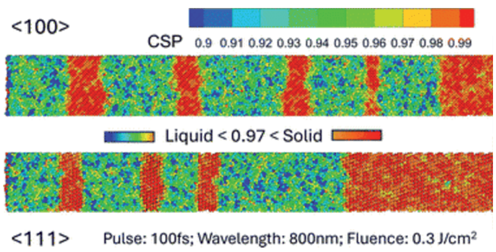
Photoinduced Reactive Dynamics in Computational Theory

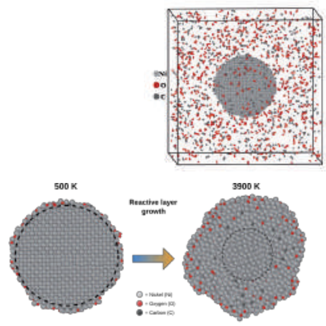




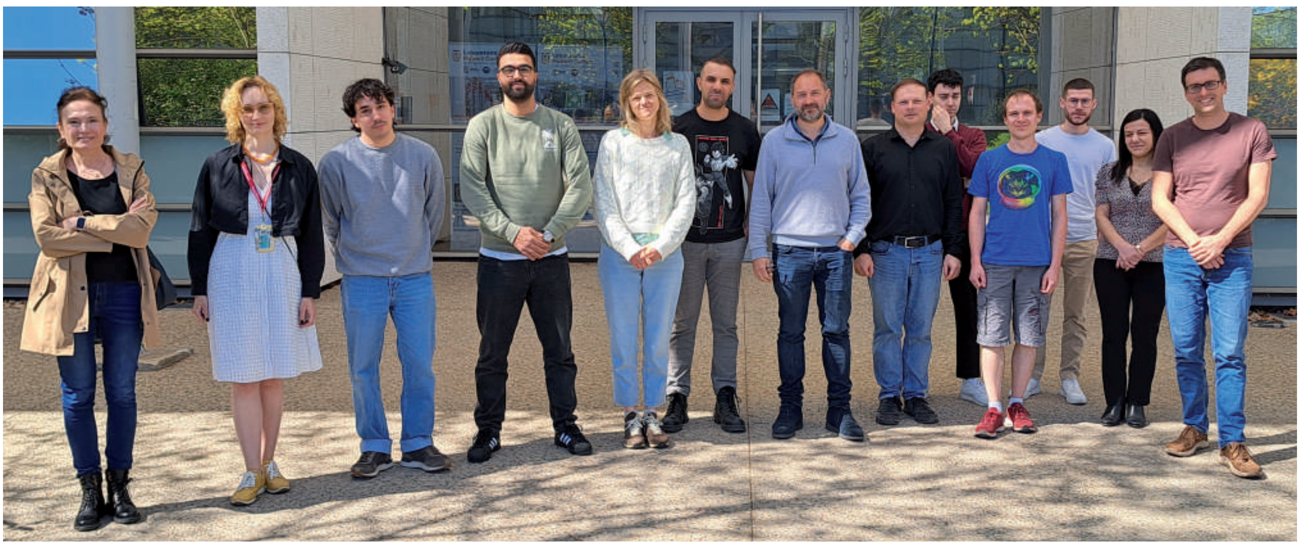








Permanent team members:
Jean-Philippe Banon
Jean-Philippe Colombier
Yuliya Dadoenkova
Emilie Gamet
Tatiana E. Itina
Elena Kachan
Anton Rudenko
Victor Kalt



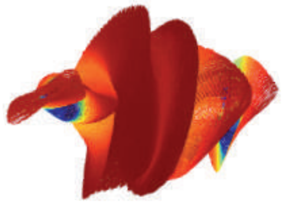
PREDICT

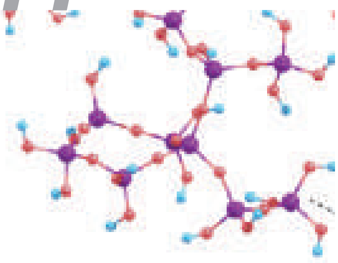
Team leader
Tatiana E. Itina (Since Jan. 2026)

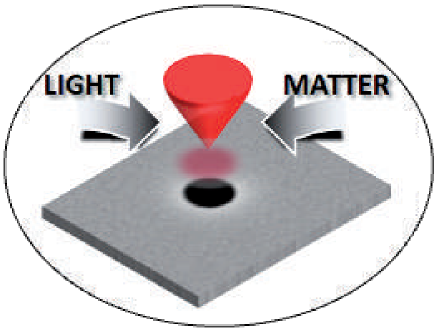
The PREDICT team addresses a central challenge in contemporary materials science: how to reliably predict the transformations of matter under intense and ultrafast external stimuli, in particular laser irradiation. The recent creation of the team in January 2026 builds on a long and recognized history of physical and optical modeling within the laboratory, where theoretical approaches have continuously accompanied experimental developments for several decades.
These activities were historically developed across several research groups, including work related to laser-matter interaction, nanostructures and nanoparticles, photonics, magneto-optics, and wave propagation. In particular, electromagnetic modeling has long represented an important strength of the laboratory, notably through activities dedicated to optical nanostructures, photonic systems, and wave-matter interactions.
Since the 2000s, the lab has further consolidated its numerical and theoretical research on laser-matter interaction, ultrafast processes, electromagnetic modeling and predictive tools. More recently, complementary developments have focused on modeling the magneto-optical properties of nanostructures, and on extending the spectrum to UV, IR and RF domains. This collective scientific heritage now converges within PREDICT and includes expertise in laser–matter interaction, ultrafast phenomena, electromagnetic simulations, atomistic modeling, and materials behavior under extreme conditions.
Building on this long-standing expertise, the team brings together complementary skills in theoretical physics, numerical modeling, and data-driven approaches in order to structure and amplify research efforts in multi-physics and multi-scale simulations. Our ambition is to bridge the gap between fundamental theoretical descriptions and predictive, quantitative simulations that can directly support experiments and technological developments. At the heart of our approach lies the coupling of electronic excitation, energy transport, atomistic motion, and chemical reactivity within unified frameworks.
By connecting ultrafast processes occurring on femtosecond timescales to structural and functional evolutions over much longer times, we aim to provide an integrated understanding of complex out-of-equilibrium phenomena. PREDICT focuses on a broad range of systems, including semiconductors, metals, and nanostructured materials, with particular attention to laser-induced oxidation, phase transitions, nanoparticle formation in liquids, and plasmon-mediated processes. These topics are not only scientifically challenging, but also highly relevant to current societal needs, such as the development of advanced photonic devices, sustainable material processing, and functional nanomaterials for energy and biomedical applications.
A distinctive feature of the team is its strong commitment to coupling modeling with experiments. By working in close interaction with experimental groups, we aim both to interpret observed phenomena and to guide the design of new experiments. This dialogue is essential for developing truly predictive models, capable of identifying optimal processing conditions and uncovering new physical mechanisms.
In parallel, PREDICT invests in the development of advanced multi-scale numerical models and methodologies. This includes hybrid atomistic–continuum approaches, two-temperature and non-equilibrium models, ab initio methods, as well as electromagnetic simulations of complex photonic structures. Increasingly, these physics-based models are complemented by machine learning strategies, enabling efficient exploration of high-dimensional parameter spaces and opening the way to inverse design of materials and processes.
The creation of PREDICT also reflects a strategic vision: to strengthen the role of modeling as a driving force within the laboratory and to enhance its visibility at the national and international levels. By fostering collaborations with academic partners, research institutions, and industry, the team contributes to a dynamic and interdisciplinary research environment.
Ultimately, the team aims to move from understanding to prediction, and from prediction to control. By developing robust and versatile simulation frameworks, we seek to enable the rational design of materials and processes under extreme conditions, contributing to the emergence of innovative technologies and to a deeper comprehension of matter far from equilibrium.

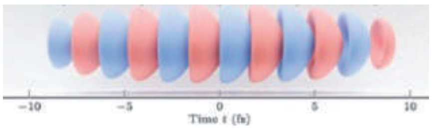
the ILM team

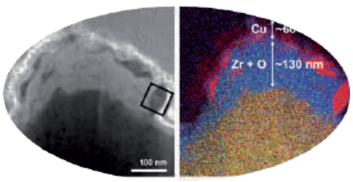
Laser-Matter Interaction

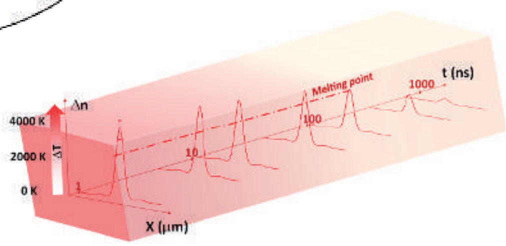


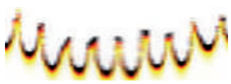


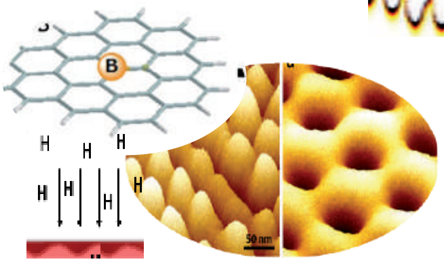


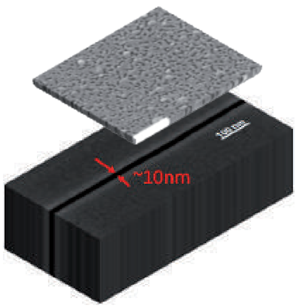












Permanent team members:
Florent Bourquard
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Jean-Philippe Colombier
Ciro D'Amico
Vincenzo De Michele
Christophe Donnet
Florence Garrelie
Elena Kachan
Anne-Sophie Loir
Florent Pigeon
Anton Rudenko
Razvan Stoian
Alain Trouillet

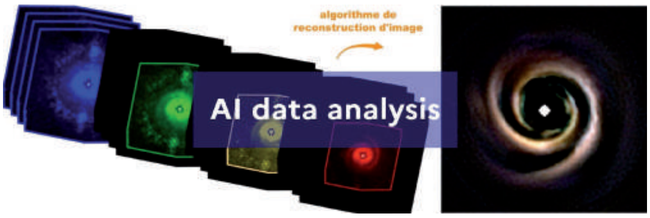
ILM

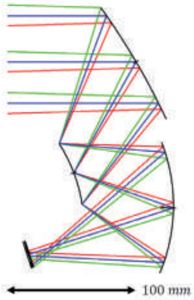
Razvan Stoian
(Team leader since 2008)

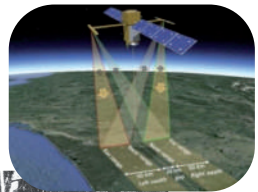
In an international context marked by the rapid acceleration of flexible, high-performance, and increasingly miniaturized laser sources, alongside continuous innovation in laser-based processes reaching down to nanometric scales, novel industrial applications are expanding at an unprecedented pace. In this evolving landscape, the central challenge is to design a new generation of controllable laser structuring tools capable of delivering extreme precision. This ambition now clearly defines the roadmap of the international scientific community. It drives research efforts toward the development of adaptable laser sources, the design of irradiation strategies capable of controlling structures beyond the diffraction limit, the digitalization of processes, and the strengthening of technological maturity across emerging application domains. These advances span a wide range of fields, including optics, photonics, mechanics, health, energy, as well as quantum technologies and information storage, and contribute to structuring the global scientific landscape and major research centers. Pioneering work carried out in the 2000s on surface engineering using ultrashort lasers has generated a strong dynamism in ultrashort laser processing, which remains a flagship activity of the laboratory today. Building on its strong scientific influence, the laboratory has played a leading role in initiating and coordinating three major "Investments for the Future" programs: LabEx Manutech-SISE (Surface and Interface Science Engineering), EquipEx Manutech-USD (Ultrafast Surface Design), and EUR Manutech-SLEIGHT (Surfaces Light Engineering Health & Society), in which laser processing occupies a central role and in which all other teams of the laboratory are involved. In this context, the ILM team has established itself as a key international reference in the field of ultrashort laser processing. A central aspect of our research lies in structuring matter to create innovative materials. The ability to engineer materials through controlled structuring has become a powerful lever in areas related to security, energy, and health. By tailoring the organization of matter, we can control, enhance, and even transform its physical properties. In particular, structuring at mesoscopic scales opens new pathways for functionalization in optics, thermal transport, chemistry, and contact-related phenomena. At the same time, progress in materials engineering relies critically on the availability of structuring tools that are fast, precise, and contactless. Achieving high fabrication speeds, maintaining pattern accuracy, and ensuring compatibility with a wide variety of materials and surface geometries remain major challenges. In this respect, ultrashort laser technologies offer unique opportunities. The ultrafast, nonequilibrium phenomena they involve enable the exploration of new irradiation regimes capable of reaching unprecedented levels of precision in the engineering of functional structures. These approaches provide powerful means to redefine mechanical, thermal, and optical material properties, which explains the sustained level of international research investment in this area. The team relies on the Femtosecond laser platform (see p.31), which it helps develop, with access also available to external users. It also makes use of the electron microscopy platform. Ultrashort laser manufacturing is therefore a particularly vibrant field of research and innovation, structured around two major scientific challenges that engage the international community. The first is to enhance process efficiency through the development of laser sources that are more powerful, faster, and more versatile. The second, which is the primarily focus of the ILM team, is to master structuring down to the smallest possible scales through advanced control of the underlying processes. Ultimately, both challenges converge toward a common objective: achieving a deep understanding and precise control of light-matter interaction at the smallest spatial and temporal scales. We develop advanced ultrashort laser processes, together with the associated instrumentation and control methodologies. In parallel, we investigate the fundamental mechanisms of light-matter interaction through direct observation, modeling, and multiscale analysis in both time and space. A particular emphasis is placed on exploring ultimate scales. Our objectives are to contribute to the emergence of a new generation of advanced laser structuring tools, to deepen our understanding of ultrafast phenomena, and to design innovative devices that harness the unique properties of ultrashort light.
To meet these ambitions, our activities are organized around several complementary research themes. Together, they form a coherent and integrative framework of expertise in laser processing, grounded in a comprehensive approach to laser–matter interaction and structuring.

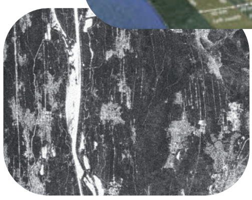
the IMAGE team

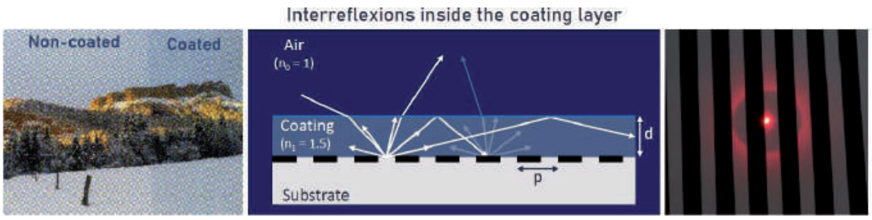
Image Science & Computer Vision





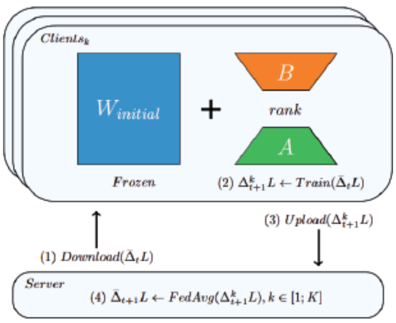


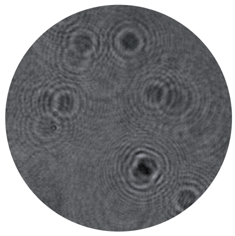




Permanent team members:

Olivier Alata	Virginie Fresse
Jean-Marie Becker	Mathieu Hébert
Pierre Chavel	Michel Jourlin
Raphaël Clerc	Hubert Konik
Philippe Colantoni	Anne-Claire Legrand
Loïc Denis	Thierry Lépine
Eric Dinet	Fabien Momey
Christophe Ducottet	Baptiste Moine
Thierry Fournel	Alain Trémeau
Corinne Fournier	Thomas Olivier





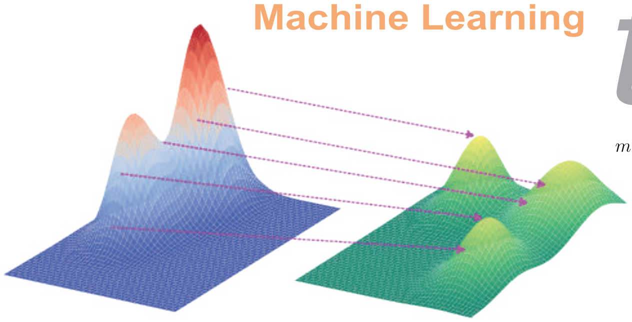
IMAGE


Team leaders
Thierry Fournel (2014 - 2025)
Loïc Denis (Since Jan. 2026)

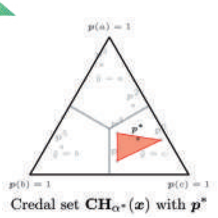
As early as 1983, the laboratory initiated novel research activities focused on image processing. At that time, it developed grayscale morphological processing, which led to close collaborations with the École des Mines de Paris, the birthplace of mathematical morphology. That same year, the Image team, together with the École des Mines de Saint-Étienne, created one of the very first (if not the first) postgraduate university degrees entirely dedicated to imaging: the DEA “Image Analysis and Processing, Image Synthesis, Artificial Intelligence.”
The late 1980s saw rapid developments in imaging and specialized parallel computing for various scientific fields. During this period, the Image team, in collaboration with CPE Lyon, developed award-winning tools for segmentation and 3D navigation within anatomical structures, particularly in the dental field, as well as biological structures such as HIV-infected T4 lymphocytes. Between 1989 and 2007, the team focused on velocimetry and granulometry in quantitative fluid mechanics, notably through the EUROPIV project, the first European contract signed by the university. Among its major contributions were the digital analysis of holograms and later digital holography, which became precursors to the current team’s “reconstruction” research axis. At that time, the first digital cameras were also under development.
In 2005, the laboratory’s electronics researchers joined the team to develop vision architectures and a high-speed digital camera before shifting, with the support of the entire laboratory, toward security architectures. This led to the creation of an independent team in 2010 (AMTES). That same year, the laboratory established, together with the Institut d’Optique, a research theme focused on lighting, visual rendering, optical imaging, and opto-digital security. This theme was positioned at the interface between the “Optics-Photonics” and “Computer Science-Telecommunications-Image Processing” departments. The “Image Processing” component brought together activities in automatic image analysis and image understanding, to which the UJM's LIGIV research group contributed through its expertise in color processing by joining the laboratory a year earlier.
In 2014, all activities related to “Image Science and Computer Vision” were consolidated into a single research team, defining the current outline of the Image team. While the GDR IASIS - Signal, Image, Vision, Machine Learning - has served as a natural framework for its research activities since its creation in 1988, its work – led to the creation in 2019 of the GDR Appamat on Material Appearance, coordinated by the team with the laboratory’s support.
Today, the Image team conducts internationally recognized research in unconventional imaging, ranging from microscopy to astronomical imaging, as well as in the detection, extraction, and interpretation of visual information through a close integration of physical modeling and image analysis. Its approach combines imaging physics and cutting-edge machine learning techniques to push the limits of current systems and develop methodologies capable of addressing computer vision tasks that open new perspectives across many application domains.
In line with its long-term trajectory and through its three project teams, the Image group is now particularly focused on designing imaging systems that integrate non-standard optical elements or that enable the reconstruction of multivariate images for scientific imaging. At the same time, it seeks to characterize material surfaces beyond color attribute by analyzing texture, gloss, and translucency through the optical properties of materials, with the goal of supporting interpretable image analysis and prototyping. The team is also working on finding adapted lighting solutions to improve visual perception, while developing and implementing explainable and resource-efficient machine learning models, as well as analyzing human expressions and behaviors within their spatio-temporal context.
Across all these activities, a common thread lies in the complementarity between artificial intelligence and imaging physics. The inversion of physical models enables the characterization of imaged objects, while self-supervised training strategies and approaches that facilitate generalization are being adapted to various research domains addressing major societal challenges. These efforts are pursued within the broader objective of developing responsible AI, notably through the partitioning of deep models across different embedded systems.

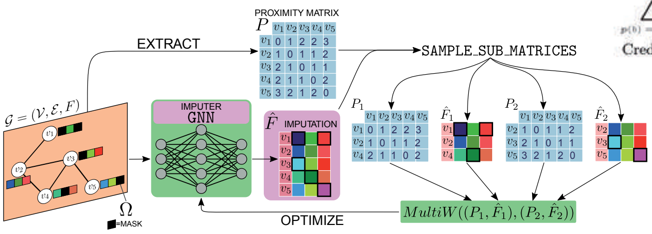
the ML team

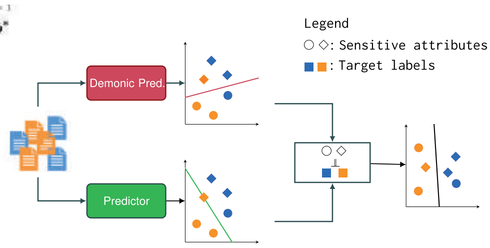
Machine Learning

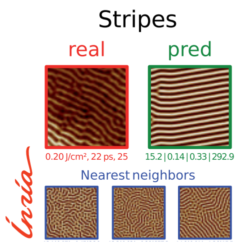


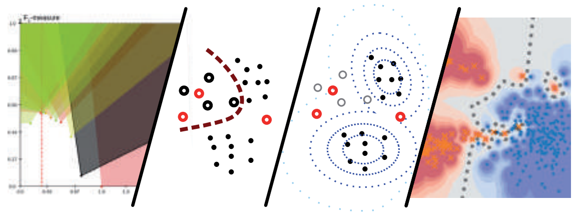
$$m_{\mathrm{D}}\left(\mathbb{E}_{h\sim\rho} R_{\mathcal{D}}(h), \mathbb{E}_{h\sim\rho} \hat{R}_{S}(h)\right) \le \mathbb{E}_{h\sim\rho}\, m_{\mathrm{D}}\left(R_{\mathcal{D}}(h), \hat{R}_{S}(h)\right)$$
$$\le \mathrm{KL}(\rho\|\pi) + \ln \mathbb{E}_{h\sim\pi} \exp\left[m_{\mathrm{D}}\left(R_{\mathcal{D}}(h), \hat{R}_{S}(h)\right)\right]$$
$$\le_{1-\delta} \mathrm{KL}(\rho\|\pi) + \ln \frac{1}{\delta} \mathbb{E}_{S'\sim\mathcal{D}^m} \mathbb{E}_{h\sim\pi} \exp\left[m_{\mathrm{D}}\left(R_{\mathcal{D}}(h), \hat{R}_{S'}(h)\right)\right]$$
$$= \mathrm{KL}(\rho\|\pi) + \ln \frac{1}{\delta} \mathbb{E}_{h\sim\pi} \mathbb{E}_{S'\sim\mathcal{D}^m} \exp\left[m_{\mathrm{D}}\left(R_{\mathcal{D}}(h), \hat{R}_{S'}(h)\right)\right]$$
$$= \mathrm{KL}(\rho\|\pi) + \ln \frac{\mathcal{I}_{\mathrm{D}}(m)}{\delta}$$











Permanent team members:

Marc Bernard
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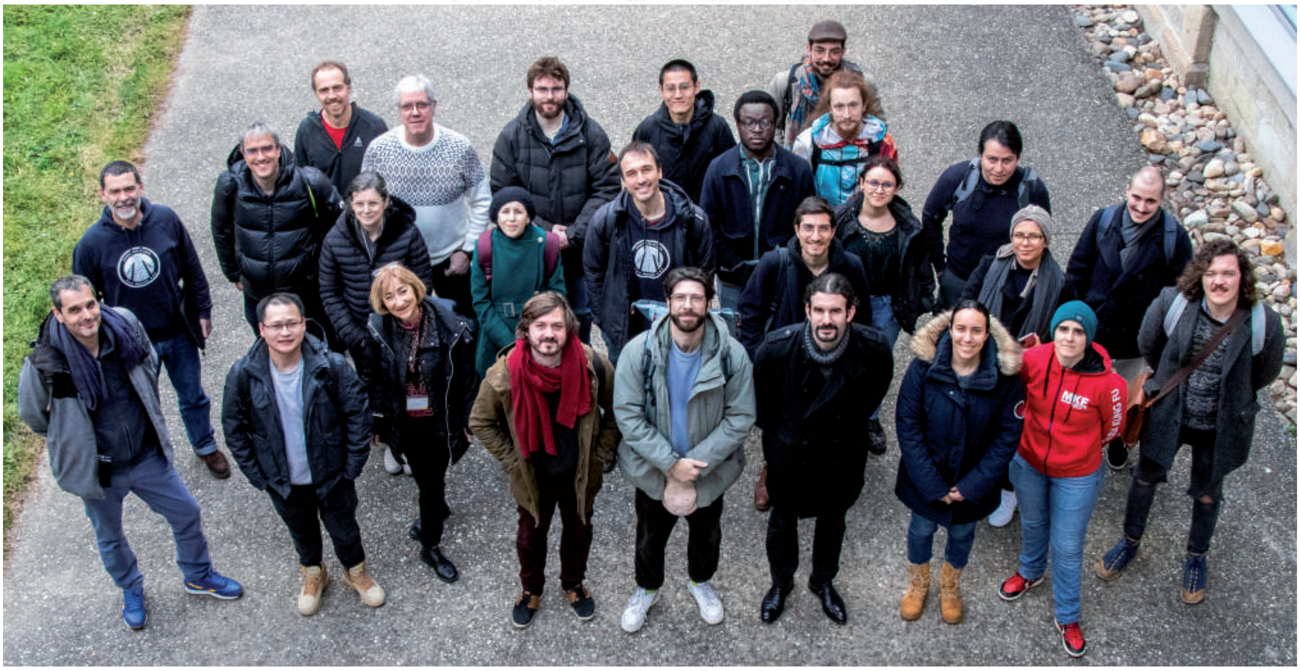
Farah Cherfaoui
Catherine Combes
Rémi Emonet
Rémi Eyraud
Mathias Géry
Benjamin Girault
Antoine Gourru
Christophe Gravier
Amaury Habrard
François Jacquenet
Baptiste Jeudy
Christine Largeron
Pierre Maret
Emilie Morvant
Fabrice Muhlenbach
Jordan Patracone
Marc Sebban
Kamal Singh
Haifei Zhang



ML

Team leaders
Amaury Habrard (2015 - 2025)
Rémi Emonet (Since Jan. 2026)

The laboratory's work in artificial intelligence dates back to 2006 with the creation of a team specializing in Data Intelligence, following the integration of the UJM-affiliated EURISE team into the UMR. About a decade later, the team expanded its activities to cover the entire data modeling and processing chain. The team grew and started to incorporating more statistical aspects, developing a strong focus on machine learning and data mining. This evolution took the form of the new **Data Intelligence** *team that focused on data mining, information retrieval, unsupervised learning, and statistical learning, thereby covering a spectrum of expertise ranging from data analysis and knowledge discovery to machine learning. These themes were developed within the context of two foundational projects: Data Mining and Machine Learning.*

The team established a strong expertise on the theoretical foundations of machine learning, on one side, and on the analysis of graphs, communities, social networks, user preferences on the the other side. To highlight this last specificity of handling non-vector data, graphs, sequences or text, we renamed the Data Mining project into the Complex Data Analysis project, at the beginning of the previous contract.

The statistical machine learning project consolidated its activities in transfer learning and generalization guaranties but also developed core work in optimal transport, optimization and at the intersection of physics and machine learning, with the creation of the Inria team MALICE.

Over the years, the team has engaged in numerous scientific collaborations, naturally with other leading machine learning research teams, but also with industrial and societal actors, and with other disciplines. The team is particularly involved in the following applications, with several approaches that have been deployed in real systems: anomaly and fraud detection, natural language processing, fair recommendations, graph and network analysis, physics-guided applications, computer vision, surface engineering, security and side-channel attack, biology and medicine with bioacoustics, medical, health and sport data analysis.

A particularity of the team is its central role in the laboratory. This comes from the potential of machine learning and artificial intelligence to impact other domains. For more than two decades the team has established collaboration within the laboratory, starting mainly with collaborations with the image and computer vision team, a domain which was one of the first to massively adopt machine learning and later deep learning, replacing hard-coded algorithms by machine learning models. Still in the computer science department, we developed a strong collaboration with the SESAM team, with a focus on using machine learning for designing and mitigating new side-channel attacks. In the last contract, we established many collaborations with the Optics, Photonics & Surfaces Department, ranging from predictive models to replace expensive experiments to knowledge discovery in laser-matter interaction.

Thanks to the cross-disciplinary synergies made possible by the unique environment that is our laboratory, we were able to create, in close cooperation with specialists of laser /radiation-matter from our ILM, MSF and MOPERE teams, the Inria MALICE team that focuses on the intersection of physics and machine learning for surface engineering.

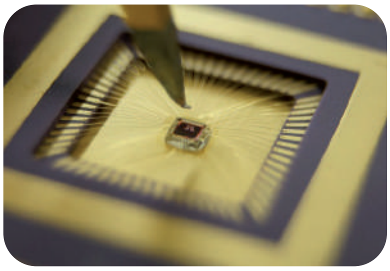
In 2026, we renamed the team to **Machine Learning** *as all members are machine learning specialists and identify to this name. In the continuity of previous evolutions, the team drives research activities organized around two complementary and tightly interlinked projects. These two new projects can be thought as the refinement of the former Complex Data Analysis and Machine Learning projects.*

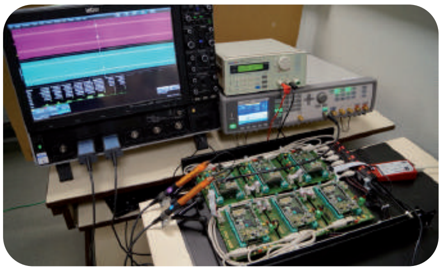
The Responsible and Trustworthy Machine Learning (RTML) leads research focused on ensuring the ethical and reliable deployment of modern AI. This includes critical work on fairness, bias detection and mitigation, model explainability, and robustness, with particular attention to complex data types like text, sequences, and graphs.

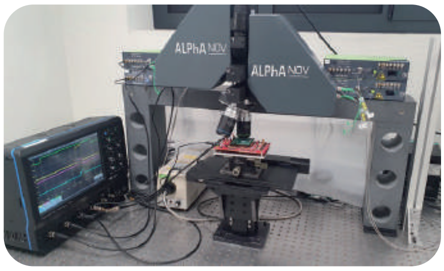
The Fundamentals and Theory of Machine Learning (FTML) drives research into the core principles underpinning modern AI. This involves deep investigations into statistical learning theory, optimization algorithms, and unsupervised learning techniques. Our specific interests lie in areas such as PAC-Bayesian theory, generative modeling, and the theoretical understanding of learning representations and operators.

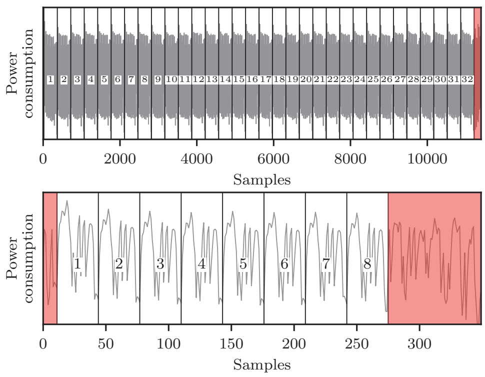
the SESAM team

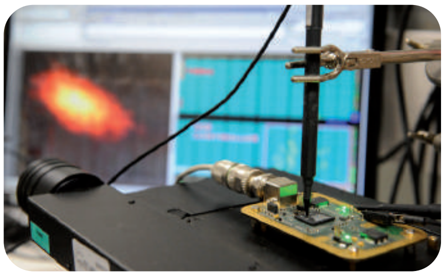
Secure Embedded Systems & Hardware Architectures



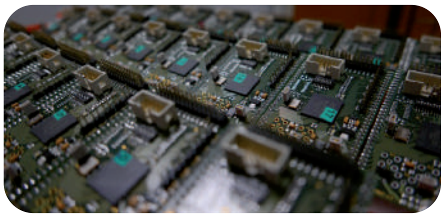


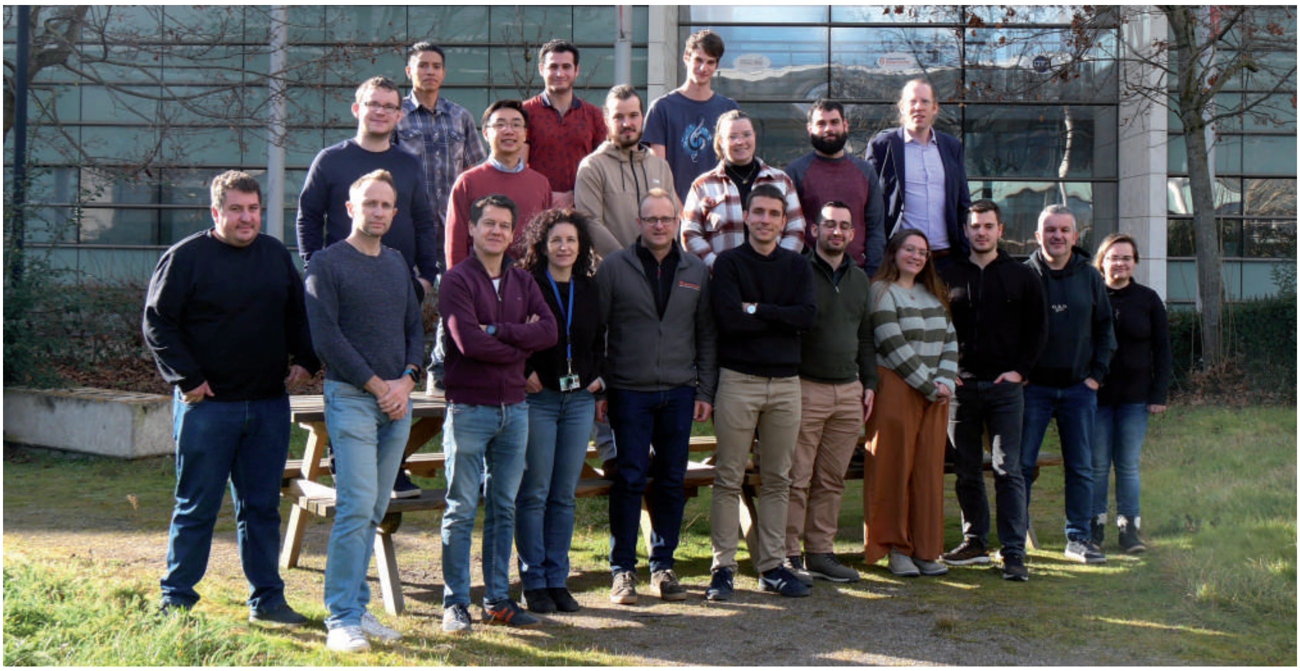






Permanent team members:
Alain Aubert
Florent Bernard
Nathalie Bochard
Lilian Bossuet
Pierre-Louis Cayrel
Brice Colombier
Viktor Fischer
Vincent Grosso
Yuko Hara
Cédric Killian





SESAM

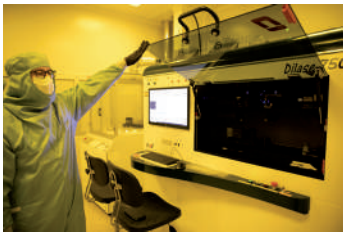

Team leaders
Lilian Bossuet (2015 - 2025)
Cédric Killian (Since Jan. 2026)

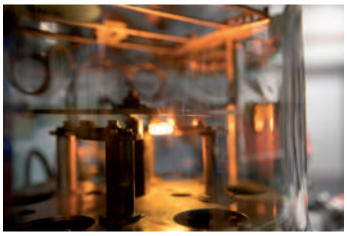
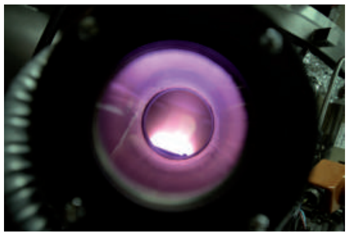
The SESAM team was established in 2005 as a research theme within the architecture group of the Image team, to which its permanent members were then assigned (one Professor, one Associate Professor, and one Research Engineer). In 2010, the team became an independent entity and adopted the name AMTeS (Hardware Architecture for Telecommunications and Security). It then focused its research on the hardware implementation of cryptographic functions and random number generation. Within two contractual periods, the SESAM team had recruited additional members and structured itself around the single theme of hardware security, a field that was gaining considerable importance both nationally and internationally. The team's ambition was to assume a leading national role in this domain — a position it holds today.
Once consolidated, the team leveraged the multidisciplinary environment of the laboratory by initiating collaborative projects with the ML, ILM, and MOPERE teams.
Over the years, the scientific activities of the SESAM team have evolved to focus on the central challenge of hardware system security. These activities are organized along four major complementary and interconnected themes: the generation of random numbers in integrated electronic circuits — whether through dynamic randomness generation using True Random Number Generators (TRNGs) or static randomness generation using Physical Unclonable Functions (PUFs) — and their applications; the design of trusted systems-on-chip; physical attacks via side-channel analysis and fault injection; and the secure hardware implementation of classical and post-quantum cryptographic algorithms. This field of expertise draws upon competencies in embedded systems, microelectronics, applied mathematics, and cryptography, all brought together within the SESAM team.
The SESAM team also contributes to the structuring and animation of the scientific community in hardware security, notably through its active involvement in the "Security of Hardware Systems" working group of the GDR SoC2 and the GDR Sécurité Informatique. Since 2003, it has organized the international CryptArchi workshop (International Workshop on Cryptographic Architectures Embedded in Logic Devices), which annually brings together specialists in the field to discuss topics related to hardware security and cryptography. These activities reflect a strong commitment to structuring the domain and fostering connections between academic and industrial stakeholders.
In continuity with this trajectory, the team's scientific orientations remain within a stable framework while integrating rapid technological developments and evolving threats. Future work will continue along the four structuring axes, with particular emphasis on improving the understanding and characterization of randomness sources, developing new attack methods and countermeasures, and advancing security-by-design approaches together with the integration of security into design tools. Greater attention will be paid to the security of complex and heterogeneous architectures, particularly in the context of systems-on-chip, as well as to the hardware-software interface. Furthermore, the emergence of new application domains — such as artificial intelligence architectures and post-quantum encryption systems — opens important research perspectives for the team. These developments are supported by state-of-the-art experimental tools gathered within the Electronics and Hardware Security platform (see p.31), which enable the exploration of novel attack scenarios and the evaluation of system robustness. In this context, the team will continue to strengthen its academic and industrial collaborations in order to maintain a leading position and contribute effectively to the scientific and technological challenges associated with hardware system security.

our technology
PLATFORMS

Most research activities of the Hubert Curien Laboratory are supported by several technology platforms fitted with specific state-of-the-art experimental tools. The equipment is operated, supervised and maintained by experienced technical and scientific staff working closely with our research teams.

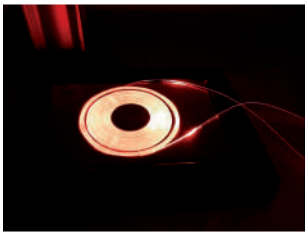
NanoSaintÉtienne



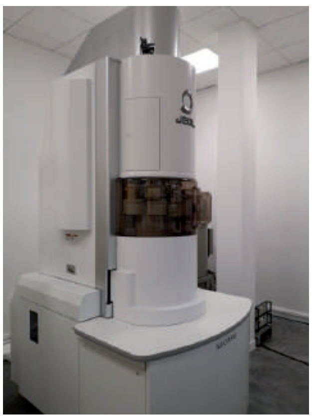
Our *Renatech+* affiliated NanoSaintÉtienne platform includes planar technology instruments dedicated to 5 main activities: gratings elaboration, thin film deposition, substrates processing, profile analysis and spectrometry.
Managed by a team of 7 people, this micro-nano technological facility is **open to industrial and academic partners**.

PETRA - Radiation Testing



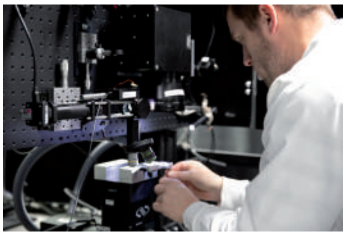
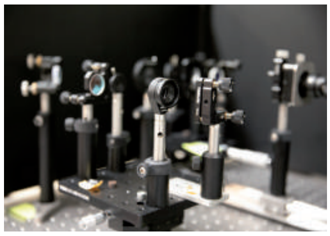

PETRA (Experimental Platform for Radiation Tests) brings together our lab's irradiation and radiation testing equipment. Built around 3 X-ray irradiation installations, it enables in-operando testing of materials, components and systems, across a wide temperature range (-120 to +400 °C) and under controlled atmospheric conditions. PETRA is **open to external users**.

Electron Microscopy

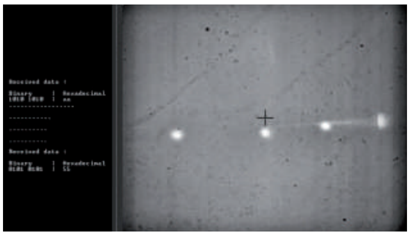
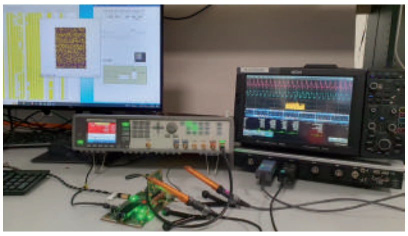
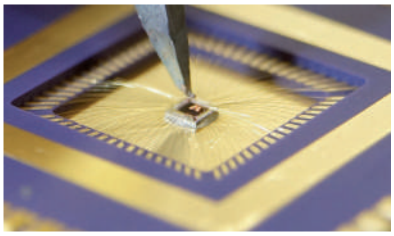

Our Electron Microscopy platform is dedicated to improve the knowledge of condensed matter structure from atomic to microscopic scale, in order to support the activities of our research teams. It is fitted with state-of-the-art equipment, including a CLYM affiliated JEOL NeoARM 200F Transmission Electron Microscope (TEM) - equipped with EDS and EELS - and a JEOL IT 800 SHL Scanning Electron Microscope (SEM). This facility is **open to external users**.

Femtosecond Laser

Our Femtosecond Laser platform features 6 ultrashort lasers with varying wavelengths, repetition rates and energy levels, covering all working environments. It supports devices such as OPAs for tunability, burst modes and variable frequencies, along with high-precision stages and scanners, spatial, temporal and polarization shaping of ultrashort laser pulses, or ultrafast spectroscopy systems. Primarily supporting the teams of our Optics, Photonics & Surfaces Department, the facility is open to external partners.

Electronics and Hardware Security

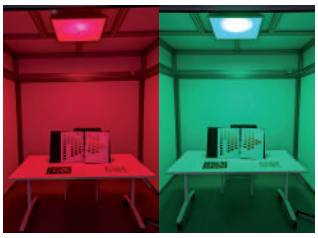




Originally founded to support the activities of the SESAM team, our Electronics and Hardware Security platform is available to all other teams within the laboratory. It includes various high-performance electronic instruments and acquisition systems, comprising both custom-developed solutions and commercial kits. Combined, these elements form specialized tools for analyzing embedded cryptography systems.

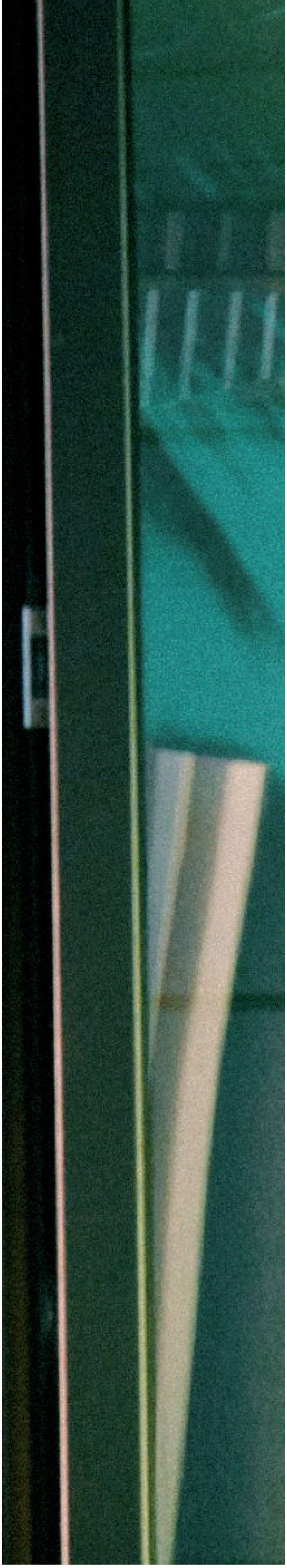
Access to IXR-Imaging & Extended Reality

© Jean Monnet University






Managed by Jean Monnet University, the IXR platform is a modular space located within the Centre des Savoirs pour l'Innovation. It provides equipment dedicated to Imaging and eXtended Reality with AR/MR/VR devices, innovative screens, and a wide range of imaging sensors: color, stereo, LIDAR, multi- and hyper-spectral, 360° and 3D scanners. Sensors, screens and XR devices can be combined with innovative lighting, such as a 24-channel spectral light or motion capture system.



1976 - 2026
anniversary

Laboratoire
Hubert Curien
UMR ▪ CNRS ▪ 5516 ▪ Saint-Étienne

50 years 1976-2026

Drawing up an exhaustive list of all the partners who have accompanied and supported our laboratory over the past 50 years would be an impossible task. Throughout these decades, countless institutions, companies and colleagues have contributed to our scientific journey, our achievements, and our growth.
On the occasion of this 50th anniversary, we would therefore like to express our warmest and most sincere gratitude to all of you.
Your trust, collaboration, support, and shared commitment have been essential in shaping the history and success of our laboratory.
Thank you for sharing this journey with us, and for contributing to what comes next !

thanks to all !

Laboratoire Hubert Curien
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50 years 1976-2026

Université Jean Monnet Saint-Étienne

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