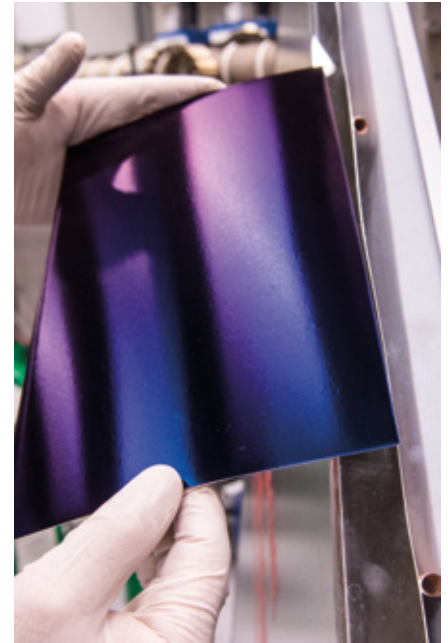
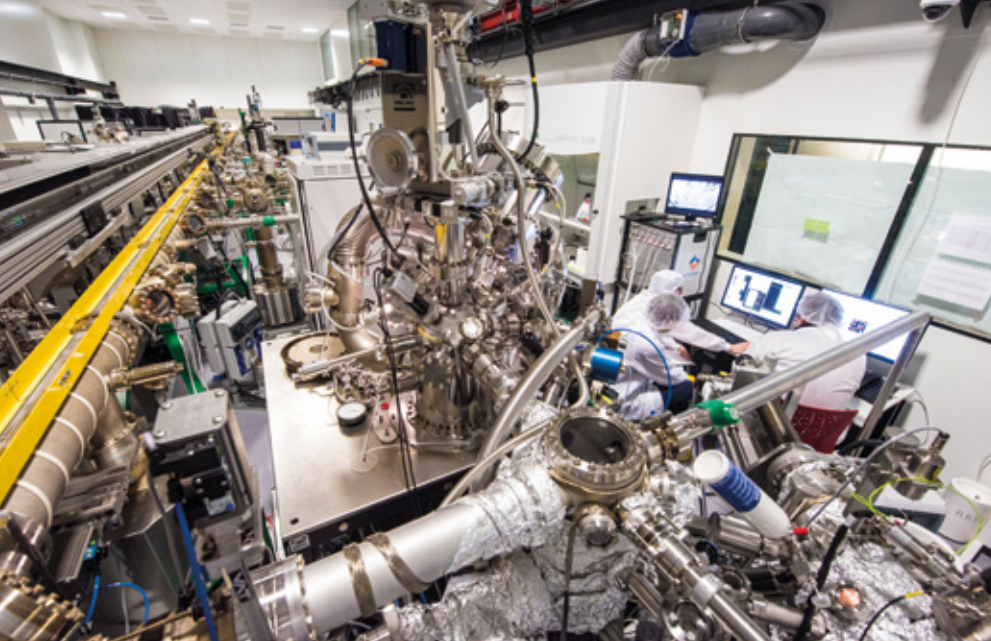


- Designing and modelling materials and processes
- Characterizing their structure
- Measuring their properties
- Integrating them into devices



## A LABORATORY AT THE SERVICE OF TOMORROW'S MATERIALS

**The Institut Jean Lamour (IJL) was created in 2009 and is a fundamental and applied research laboratory specialized in science and engineering of materials and processes.**

It regroups scientists from different disciplines within a joint research unit (UMR 7198) of the CNRS and the Université de Lorraine. They cover the following fields: materials, metallurgy, plasmas, surfaces, nanosciences, electronics.

Within the Université de Lorraine the Institut Jean Lamour belongs to the "Matter, Materials, Metallurgy, Mechanics" (M4) research center. The IJL is born from the merging of 6 laboratories and it capitalizes on the skills of its previous UMRs, certain of which existed for more than 50 years. The wide range of skills present in the IJL

allows the study of materials "from one atom to one ton", which spans not only the study of nano- and microstructures and properties but also manufacturing processes. The whole activity is closely linked to industry and uses a sustainable development approach. The Institut Jean Lamour is located in Nancy in a new building of 28,400 square meters on the multi-disciplinary Artem campus. There, the IJL stands alongside Mines Nancy, the National Nancy School of Arts and the ICN Business School. The laboratory also has premises in other campuses in Nancy as well as in Epinal and Metz.

# 23 RESEARCH GROUPS ORGANIZED INTO 4 SCIENTIFIC DEPARTMENTS

## Physics of Matter and Materials

### 5 groups:

- Nanomagnetism and spintronics
- Surfaces and spectroscopy
- Intermetallic compounds and hybrid materials
- Nanomaterials
- Physics of high-temperature plasmas

## Chemistry and Physics of Solids and Surfaces

### 8 groups:

- Plasmas - Processes - Surfaces
- Optical and electrical properties of thin films for energy
- Metallurgy and Surfaces
- Materials with thermoelectric properties
- Carbon-based materials
- Surface and Interface, Chemical Reactivity of Materials
- Materials for Civil Engineering
- Chemistry and electrochemistry of materials

## Materials Science and Engineering - Metallurgy

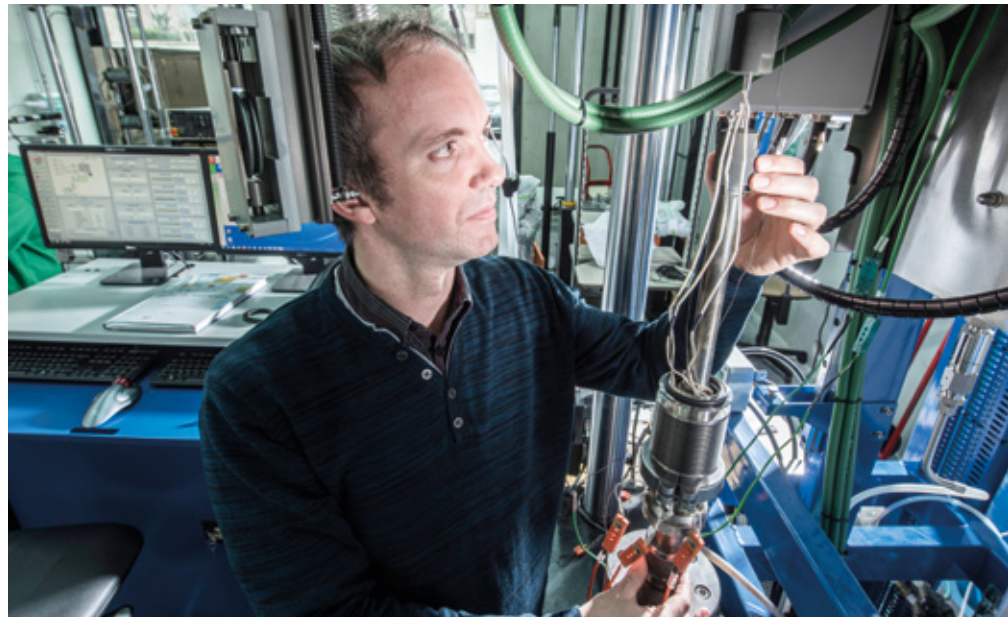
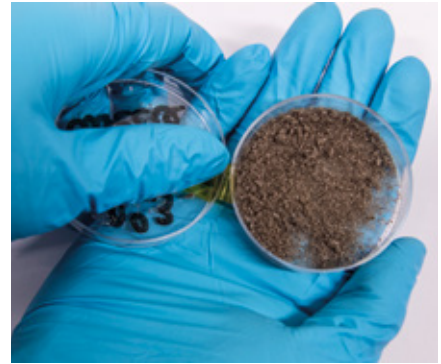
### 4 groups:

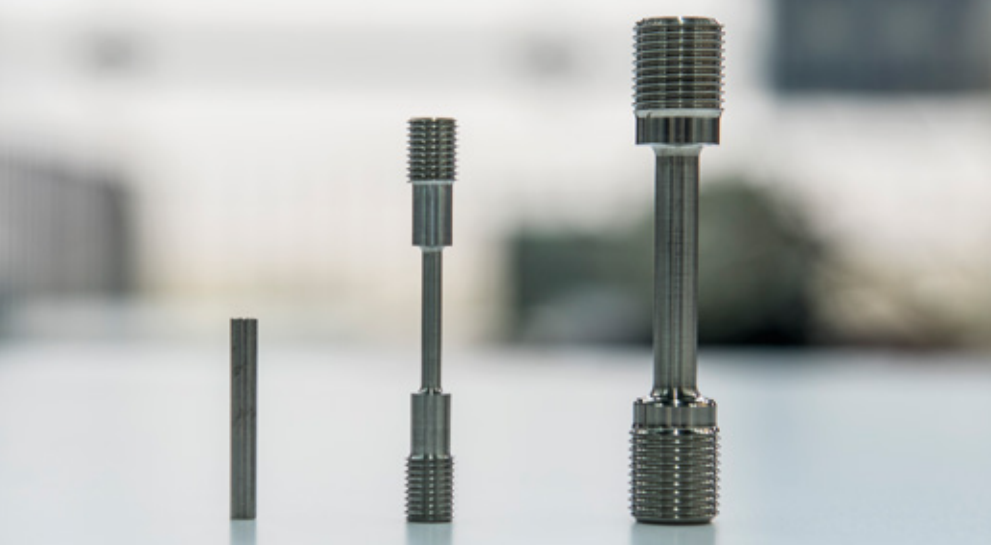
- Metallurgical Process Engineering
- Solidification
- Microstructures and Stresses
- Physics, Mechanics and Plasticity

## Nanomaterials, Electronics and Living Systems

### 6 groups:

- Nano-bio-materials for life
- Bio-sourced materials
- Nanomaterials and Health
- Micro and Nanomechanics for the living
- Micro and nanosystems
- Electronic Measurements and Architectures





## INVENTING TOMORROW'S MATERIALS TO SERVE:

### Health

In the fields of medicine and biology, materials for life must exhibit specific features that ensure perfect safety in addition to performance levels. This is the case for drug delivery, implant operations or biosensors *in vivo*.

### Energy

The laboratory works in the framework of energy transition by proposing new materials that:

- produce hydrogen more efficiently
- enhance efficiency in the conversion and storage of forms of green energy
- encourage or on the contrary limit heat exchanges
- extract the energy produced by nuclear fusion plasmas.

### Mobility

Lightening metallurgical structures, using biosourced materials in batteries, moving to “all electric” and reusable complex materials like composites are important fields of application dealing with transport. They all have strong industrial and societal potentials.

### The industry of the future

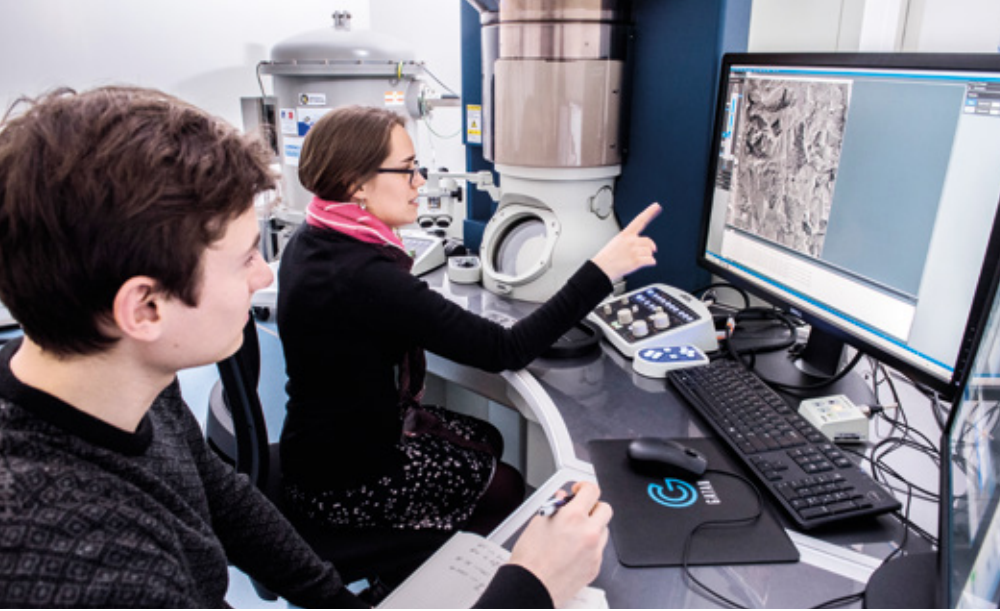
Additive manufacturing, ecodesign and modelling are used to produce intelligent, functional, high-performance materials and innovative processes with the objective of supporting companies that are transforming and evolving.

### The preservation of resources

It is essential to provide alternatives to rare materials by using abundant materials in a more original manner and by increasing the control of surfaces and interfaces' properties through advanced processing techniques. These techniques go along with a better use of mineral resources from mining or recycling. They also provide less energy-costing information storage solutions through the use of nanomagnetism, for example. These approaches need to be part of an overall approach involving life cycle analysis, which is capable of evaluating their environmental impact.







The Institut Jean Lamour has more than 600 scientific instruments, most of them are gathered within competence centers.



## TECHNICAL PLATFORMS AND EQUIPMENT

They play the role of true technical platforms - open to external users in the following domains:

- Measurements of magnetic properties and cryogenics
- Computing and scientific calculations
- X ray diffraction and Mössbauer spectroscopy
- Electron microscopies, microprobes and metallography
- Instrumental development
- Micro and nano-manufacturing
- Deposition and analysis of nanomaterials under ultra-high vacuum
- Vibrational spectroscopies and lasers

The laboratory also includes a technological research group dedicated to materials development for additive manufacturing technologies.



# INDUSTRIAL PARTNERSHIP

**28 theses financed by companies** are in progress (2018).

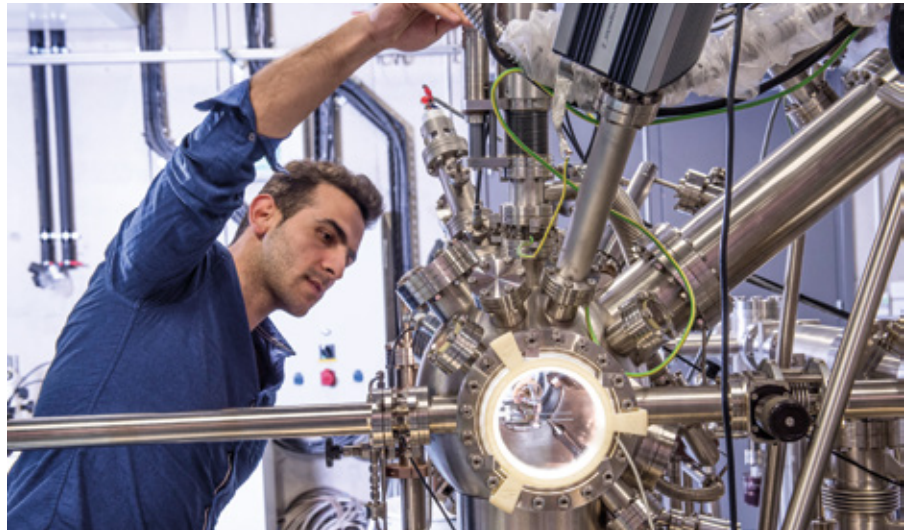
**35 patents** have been deposited since 2009.

**4 start-up** have been created (APREX Solutions, Cryoscan, O2M Solutions, ProViSys Engineering) thanks to technological transfers.

**3 “joint laboratories”** (ANR programmes) have been created since 2009: one with Viessmann on thermal solar panels, the other with Vinci Technologies on nanomaterials and a 3<sup>rd</sup> one with Nipson Technology on magnetic printing.

**2 industrial chairs** have been launched in 2019: one dedicated to metallurgy of the liquid metal, the other one to information storage by ultrafast laser pulses.

**The Technology Transfer Office (TTO)** acts as an interface between the laboratory and companies. Its project engineers work on providing solutions for industrial problems and issues. These engineers' work is supported by our researchers and they also benefit from access to all laboratory's development and characterization resources.



Partnerships exist with more than 100 companies in fields as varied as: aeronautics, car industry, building trade, electronics, energy, nuclear, health, railway transport.

# COLLABORATIONS AND NETWORKS

## France

The Institut Jean Lamour is the co-founder of **Labex DAMAS** (Design of Alloy Metals for low mAss Structures).

It is a partner of **21 CNRS Research Networks**.

It is a member of **ICEEL** (Institut Carnot Energie et Environnement in Lorraine) and it collaborates with **IRT M2P** (Institut de Recherche Technologique

Matériaux, Métallurgie et Procédés), **MetaFensch** and **Materialia** and **Fibres-Energivie** competitiveness Poles.

## International

Our research groups collaborate with **more than 30 countries** in the framework of **200 collaborative actions**.

**3 International Associated Laboratories** have been founded by the Institut Jean Lamour since 2009: with Luxembourg, Slovenia and the United States of America.

# EDUCATION

The Institut Jean Lamour contributes to many of the Université de Lorraine's graduate and postgraduate programs including:

## Master in Physics

- Condensed matters and Nanomaterials
- Fusion Sciences and Plasmas

## Master in Chemistry

- Chemistry of Solids for Energy
- Synthesis, Characterization, Environment

## Master in Sciences and Materials Engineering

- Advanced Materials Science and Engineering (Erasmus Mundus)
- Advanced Metallurgy (French-German partnership)
- Design and Application of Metallic Alloys for Structures (international Master)
- Physics and Chemistry of Materials

## Master in Civil Engineering

Structures, Materials, Energy in Building

## Master in Electronics, Electrical Energy and Automatic

- Embedded Electronics
- Smart Sensors and Micro-Nano-Technologies

## Degrees in Health

- DFA (Master) in Pharmaceutical Sciences
- DFA (Master) in Odontological Sciences
- Master in Health
- Master in Health Engineering: Bioengineering, Nanohealth, Drugs, Quality

- Master in Life Sciences: Biotechnologies

## Engineering schools

- EEIGM, École Européenne d'Ingénieurs en Génie des Matériaux
- ENSGSI, École Nationale Supérieure en Génie des Systèmes et de l'Innovation
- ENSTIB, École nationale Supérieure des Technologies et Industries du Bois
- Mines Nancy
- Polytech Nancy

## Doctoral schools

The Institut Jean Lamour hosts more than **170 PhD students** who study at the following doctoral schools : C2MP (Chemistry, Mechanics, Materials, Physics), IAEM (Computing, Automatic, Electronics-Electrotechnical, Mathematics) and BioSE (Biology, Health and Environment).



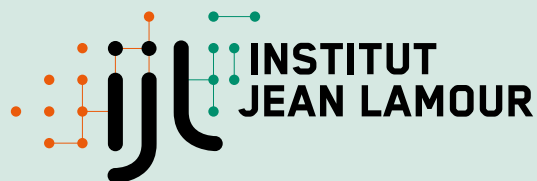
# SCIENTIFIC MEDIATION

The Institut Jean Lamour is open to different publics and its research groups are aware of the need to make their research accessible to all.

This task of scientific mediation takes different forms:

- Organization of scientific workshops in schools
- Visits for school groups

- Setting up of temporary or mobile exhibitions
- Training for secondary school teachers
- Involvement in scientific culture events and organization of popularized events: Science Festival, Researchers' Night, Physics Olympiad, etc.



## KEY FIGURES

### Staff (2018):

**Research staff: 236**

**Support staff: 99**

**Students: 330** (including **174** PhD students)

**Publications: 300** peer-reviewed articles (2018)

### Industrial partnership:

**100** industrial partners;

**35** patents; **4** start-up; **3** joint laboratories;

**2** industrial chairs

**International: 200** collaborative actions with **30** countries; **3** international associated laboratories

**Seminars: 100** per year

**Budget (2018): 9** million euros

### 5 sites:

Epinal, ENSTIB

Metz, Technopole

Nancy, Campus Artem

Nancy, IUT de Brabois

Nancy, Polytech

## CONTACT DETAILS

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The Institut Jean Lamour is a joint research unit (UMR 7198) of:



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DE LORRAINE

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It is supported by:



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RÉPUBLIQUE FRANÇAISE



Grand Est  
ALSACE CHAMPAGNE-ARDEENNE LORRAINE  
L'Europe s'invente chez nous

métropole  
Grand Nancy

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