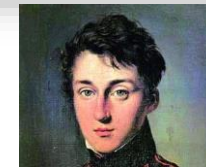
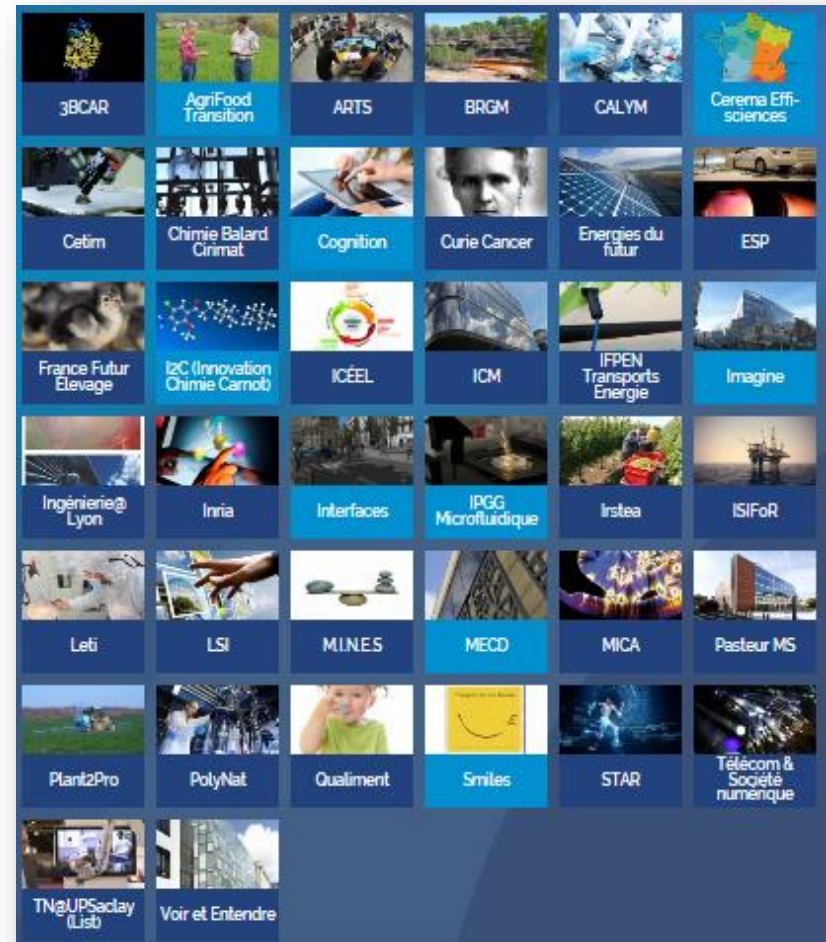


# Carnot institutes



RESEARCH &  
INNOVATION  
for INDUSTRY

<https://www.instituts-carnot.eu/en>



WHY 'CARNOT' ?

*Requested to improve steam engines, Nicolas Léonard Sadi Carnot (1796-1832) established the second law of thermodynamics.*



MINISTÈRE  
DE L'ENSEIGNEMENT SUPÉRIEUR  
ET DE LA RECHERCHE

# Carnot institutes (29 in France)

- An organization set up by the **French Ministry of Higher Education and Research** in 2006
- French public research labs or consortia selected for a set of **common features**:  
Scientific excellence , Proven, high-level history of research partnership,  
Professionalism



MISSION : to support companies in their product and service innovation efforts & to contribute to the competitiveness and growth of the national economy

# Carnot institutes

## Key figures (2018)



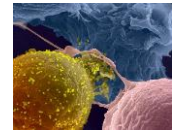
- **18% of the French public laboratory workforces**,  
31000 research professionals *with more than 9300 PhD*
- **50% of the R&D funded by companies in French public research**  
*9000 R&D contracts with industry (3600 with SMEs – ISEs)*
- **Over 25200 peer-reviewed articles** in 2017 (1/3 of the French peer-reviewed articles)
- **75 spin-off companies** spun off per year
- **1020 priority patents** filed in 2017 (Second French IP actor)
- +4% annual growth of business R&D contracts*
- 710 M€** of partnership contracts with companies
- 309 M€** of collaborative contracts with companies  
(including 136 M€ European projects)

# Carnot institutes

## ■ Carnot consortia for a more efficient answer to SMEs' needs

- **Coordination** of Carnot R&I skills towards specific **economic sectors**
- With clear and **structured common offers** for research partnerships and technological transfers
- For easier access to **technological platforms networks**
- And dedicated teams for an appropriate **support to SMEs**

- Aircraft manufacturing
- Automobile
- Renewable Energies
- Advanced manufacturing
- Extractive & first transformation Industries
- Health
- Fashion & Luxury
- Sports & Wellness



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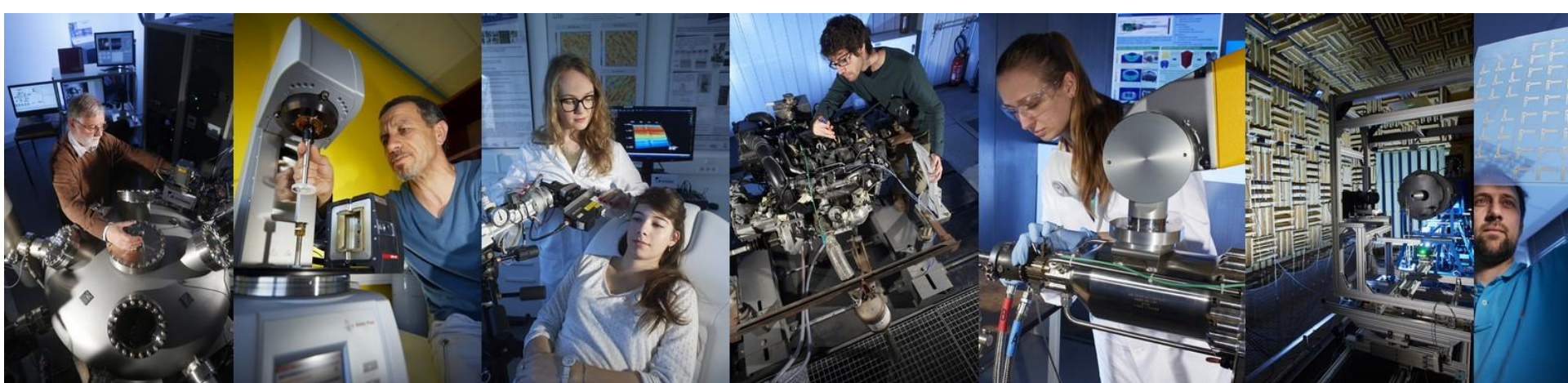
## ■ Active stakeholder for improving SMEs' participation in partenarial research

- Annual business meeting « Les **Rendez-Vous Carnot** » in Paris / Lyon
- Numerous business meetings dedicated to SMEs
- Carnot experts involved in **SMEs' National Contact Point**

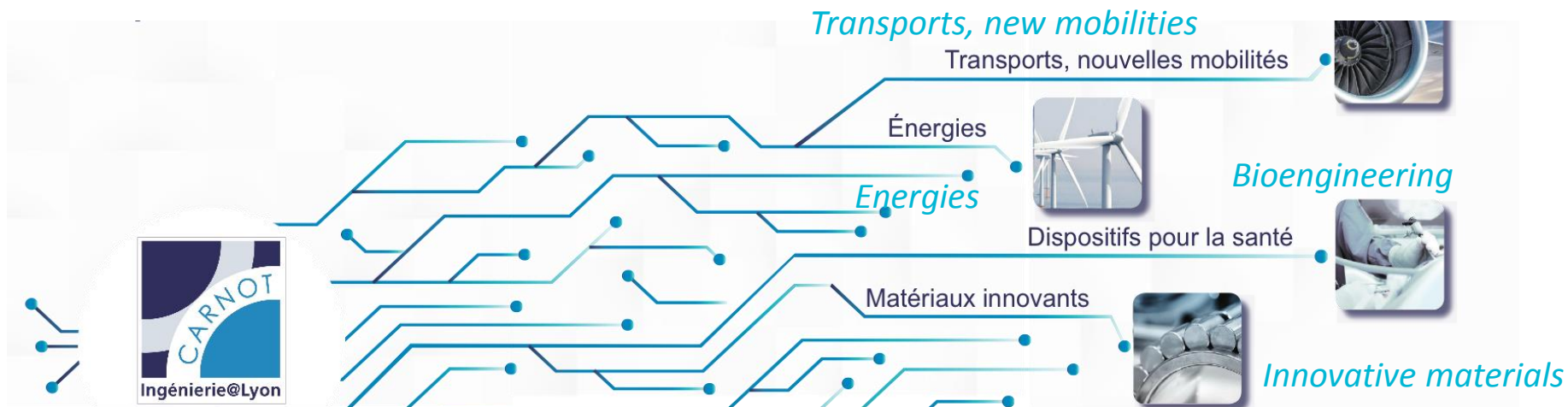


*Ensure your technological leadership!*

INNOVATIVE MATERIALS & PROCESSES  
SMART MACHINES  
from design to use



# Ingenierie@Lyon, our laboratories are your strength, our platforms your future



*A real culture of working together, agile research strategies, dynamic networks and unified and professional contractual relations, associated with a technology transfer network, and a pool of spin-off companies (9) to strengthen the offer to higher Technology Readiness Levels.*

**13 laboratories and 1 technical centre focused in engineering from main universities and engineering schools of Lyon - Saint-Etienne (presenting more than 15 M€ of direct contracts with companies)**

Tribologie et Dynamique des Systèmes LTDS • Mécanique des Contacts et Structures LaMCoS • Mécanique des Fluides et Acoustique LMFA • Ingénierie Matériaux Polymères IMP  
 Matériaux, Ingénierie et Sciences MATEIS • Énergie électrique, Bio ingénierie, Systèmes AMPERE • Vibrations et Acoustique LVA • Énergétique et Thermique CETHIL  
 Multimatériaux et Interfaces LMI • Électrique Génie et Ferroélectricité LGEF • Automatique, Génie des procédés, Pharmaceutique LAGEPP  
 Chimie Catalyse Polymères et Procédés C2P2 • Mécanique, Matériaux et énergétique LabECAM • Plastique Composites IPC

1358 (full time equivalent)

774 PHD's

more than 200 thesis

more than 1600 peer-  
reviewed journals

105,8 M€  
consolidated budget

**1784**  
**research staff**

7 teaching/research  
chairs with industrials

Contract research  
726 contracts with 423 entreprises  
Revenues : 14,7 M€ of wich 3 M€ with  
SME's, VSE'S and Mid-cap companies

9 international laboratories or  
units in Brésil, Canada, Japon,  
Chine, Italie, Ukraine

737 patents





## Industrial uses :

**TRANSPORTS** Motorization systems, propulsion flux, lighter-weight materials, security, smart systems, environmental impact

**ENERGIES** Optimization, energy management, energy conversion, storage, environmental impact

**BIO ENGINEERING** Medtech, computer-based procedure, biomaterials, diagnostic tools, sports and wellness devices

**MATERIALS** Metals, composite materials, polymers, ceramics, bio-based, smart architected multifunctional recyclable materials

## Key competences and platforms on :

**Materials**

**Tribology, surfaces and interfaces**

**Rotating machines**

**Acoustics and vibration**

**Energy and environment**

**Bio-engineering**

## An additional force to boost your innovation : 10 SME's, most of them created by engineers and PHD's of our laboratories



Mechanical aeronautical and energy engineering



Structural mechanics: numerical calculation and simulations



Thermal properties: modelling and characterisation



Drive gear power transmission: design and measures



Physical metallurgy: modeling and characterisation



Structural mechanics: dimensioning and experiments



Fluids mechanics: numerical simulations and experiments



Acoustics, vibrations, time reversal



Dynamics of rotating machines and structures: diagnostics and measures



Engineering Center for Health, Experimental and Numerical Tribology

Extensive experience in hosting and supporting foreign company's research programs



## They are working with us and trust in Carnot program :

Acoem, Activation, Acystème, Advicenne, Aguettant, Airbus Helicopters, Airbus, Akeo International, Alstom, Amphenol, Andritz, Anthogyr, Aperam, Araymond, ArcelorMittal, Areva, Arkema, Aroma, Astrium, Atherm, Atlantic, Avnir Engineering, Axel'One, Babolat, BASF, Batilux 21, Bayer, Biomerieux, Bmi, BP chemicals, CEA, Centum Adetel, CETIM, Chanel, CIAT, Citroën, Clarins, CNES, Constellium, Cornilleau, Cornis, Coval, CSInstruments, Cytosial Biomedic, Daikin, Danfoss, DCNS, Decathlon, Decorec, DrillScan, DSM, EDF, Eiffage, Elkem Silicones, Emerson, Engie, ESI Group, Eurocave, Exxon-mobil, EyetechCare, Faure, Faurecia, Fibercryst, Fluid'planet, France Paratonnerre, Gattefossé, GE Oil & GasGoupe EADS, Greenmot, HEF Group, Herakles, Hevatech, Hexcel CompositeHorus Pharma, Hutchinson, IFP, IFPEN, IHI Corporation, INEOS, Infineon, Influtherm, Irisbus, IRLynx, Iveco, Janssen pharmaceuticals, Johnson&Johnson, Kallistem, Kaplan Industriel, Lactips, Lafarge, Liebherr, Linxens, Magnum Pirex, Maïa-Eolis, Marken Image, Mecachrome, Medical Group, Medtronics, Merial, Messier-Bugatti-Dowty, Michelin, MicrodB, Neolix, Nexans, Nidec Asi, Novasic, NTN-SNR, Numtech, On-Semiconductor, Optimex, Oridao, Pechiney, Petzl, Philipps, PK-ENR, Plastic Omnium, Poma, Prayon, PSA, Radiall, RATP, Reel, Renault Trucks, Renault, RexamHealth, Robert Bosh, Rollex, Sabic, Safe Metal, Safran, Saint-Gobain, Sanofi Pasteur, Santarelli, Sasol, Schneider Electric, Seb, Septodont, SERF, Sesame Pharma, Siemens, Silsef, Siltronix, SKF, SNCF, Snecma, Solvay, Solystic, Somfy, Sopavib, St Gobain, ST Microélectronies, Staar, Steelmag, Strand Cosmétics, Subsea, Synthomer, Techteam, Tefal, Tekka, Teleflow, Texelis, Thalès, Toray, Tornier, Total, Toyota, Traqueur, Trilogiq, Unilever, Universal Oil Products, Valeo, Varioptic, Velecta Paramount, Vetoquinol, Vibratec, Volvo Trucks, Wheelabrator, Zodiac...





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