2015/2016 ACTIVITY REPORT

ARMINES

A LEADING INNOVATOR THROUGH COLLABORATIVE RESEARCH

Targeted research *for* ***industry growth*** *and the* ***training*** *of new generations of* ***engineers***

ARMINES, set up in 1967 at the instigation of senator Pierre Laffitte, will soon be celebrating ***half a century of existence,*** *as will the first joint research centre set up with one of its partner schools: MINES ParisTech,* ***the Pierre-Marie Fourt materials centre*** *in Évry (Essonne), which has worked in close partnership with manufacturers ever since, (aeronautics, car manufacturing, energy) as well as the sector that produces new, lighter and more durable materials with new characteristics.*

This centre is ***a prime example of what this unique French public/private partnership*** *between ARMINES and its partner schools can achieve in terms of targeted research, teaching and training assignments through collaborative research:* ***financial leverage*** *on the State's public resources for the scientific resourcing of teams or the development of new research centres, as with the Sophia-Antipolis (Alpes-Maritimes) campus with MINES ParisTech, or the Georges Charpak Micro-electronics centre in Gardanne (Bouches-du-Rhône) with MINES Saint-Étienne.*

The centres' areas of excellence and related resources have evolved over time to ***meet or anticipate the requirements of the socio-economic world and society.*** *In addition to the historic areas of expertise in the geosciences and the exploitation of subsoil resources, materials or energy, others have been added over the years: the sustainable and circular economy, autonomous cars, robotics, the Internet of Things, Cloud computing, new manufacturing methods and machines, biomedical techniques, bioelectronics or more recently bio-informatics and big data. And last but not least, the human, social and economic sciences.*

It is a broad spectrum that touches on many fields of knowledge and economic sectors and our joint teams will continue to adapt.

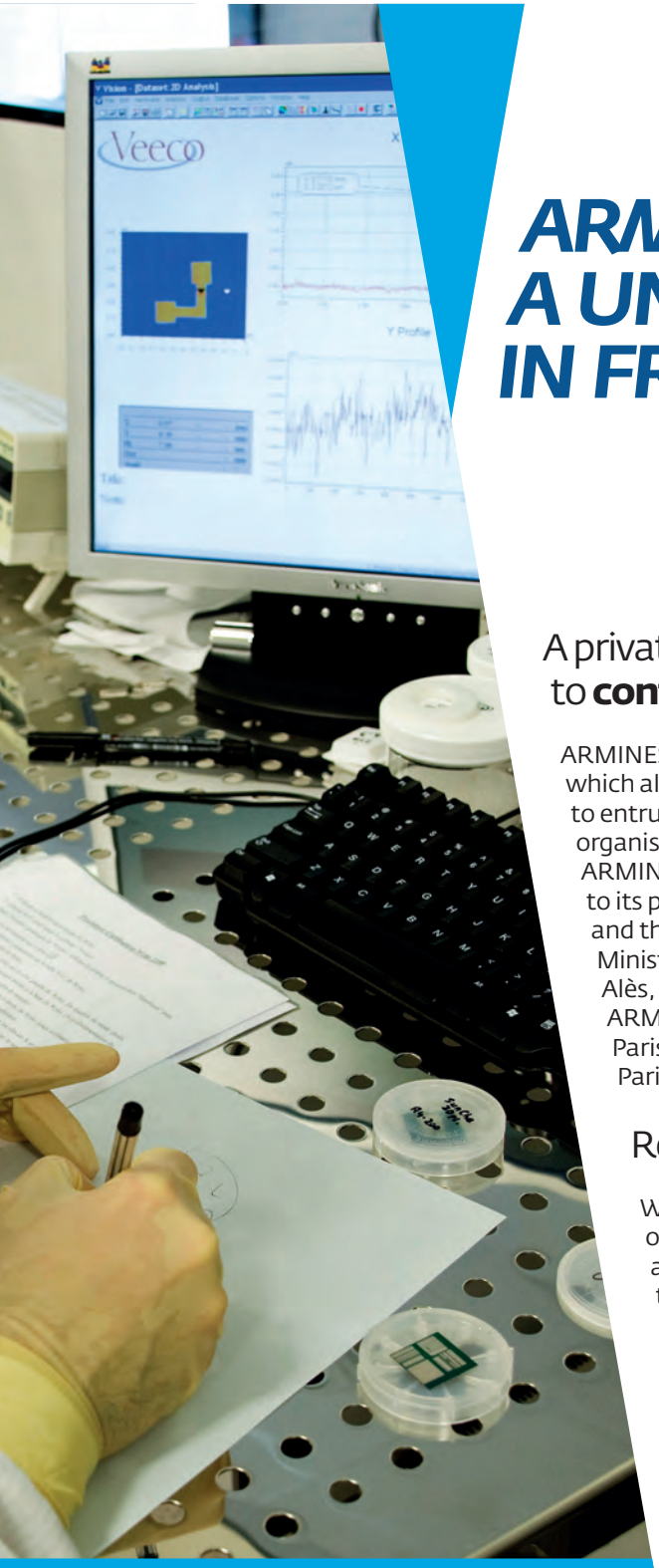
Combining scientific excellence and co-creating new knowledge, new products or services with companies is in our DNA and is achieved with our partner schools, *by training new generations of engineers and future leaders through research to cater for corporate requirements in the future.*

We would like to thank ARMINES' and the schools' staff for their dynamism, and the companies for believing in us.

Robert Brunck, President

Patricia Renaud, Director

The research work carried out by ARMINES within the framework of ARMINES Schools' joint research centres is eligible for research tax credits, under the same terms as public laboratories (article 244.4 quater B II of the French General Tax Code).



ARMINES, A UNIQUE ORGANISATION IN FRANCE

A private-sector organisation dedicated to **contract research**

ARMINES operates within the framework of the law of 18 April 2006 which allows public higher education or research establishments to entrust their contractual research activities to private-sector organisations.

ARMINES is bound by French government-approved agreements to its partner schools, chief amongst them being MINES ParisTech and the Ecoles des Mines network under the supervision of the French Ministry of the Economy, Industry and the Digital Sector: Albi-Carmaux, Alès, Douai, Nantes and Saint-Étienne.

ARMINES also collaborates with laboratories at Polytechnique ParisTech, ENSTA ParisTech, the École Navale and the École des Ponts ParisTech.

Reactivity, proximity and efficiency

With its status as a non-profit making association under the terms of the 1901 law, ARMINES has the managerial autonomy required to act swiftly, therefore empowering the research centres to deal with the economic world in an effective manner: the ability to decide, make commitments and react quickly, unfettered by bureaucratic red tape, and therefore be capable of undertaking activities for which researchers must have a free hand.

Staffed by 548 employees, ARMINES contributes to the development of research centres it shares with its partner schools.

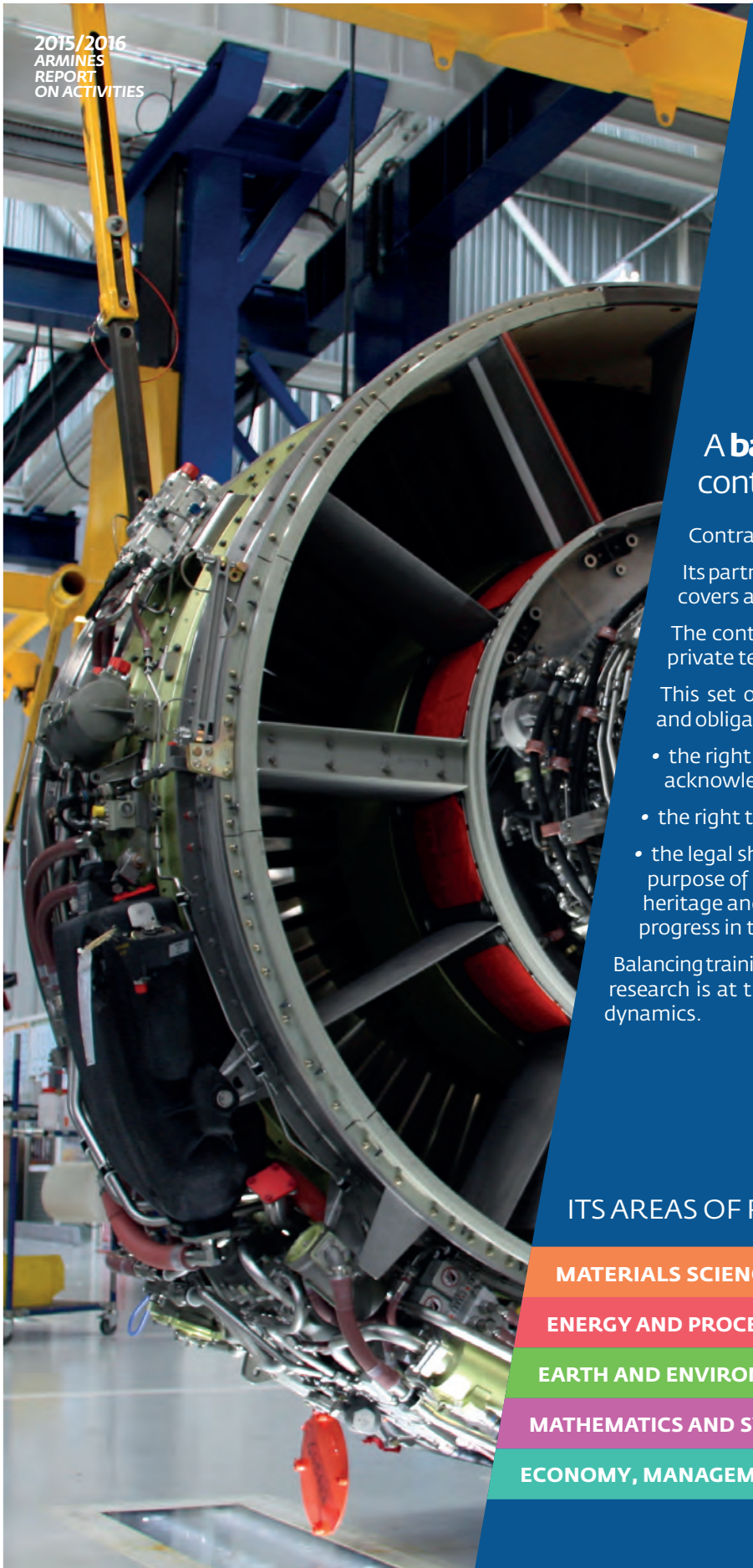
49 YEARS OF COLLABORATIVE RESEARCH AND SHARED SKILLS

LEADING COLLABORATIVE RESEARCH ORGANISATION IN FRANCE

€44.7 MILLION OF CONTRACT ACTIVITY IN 2015

MINES Albi-Carmaux · MINES Alès · MINES Douai · MINES Nantes · MINES Saint-Étienne

MINES ParisTech · ENSTA ParisTech, université Paris-Saclay · École Navale · École Polytechnique · École des Ponts ParisTech



NEW MATERIALS DEVELOPED FOR THE AERONAUTICS INDUSTRY. MINES PARISTECH - ARMINES MATERIALS CENTRE AND SNECMA - SAFRAN GROUP PARTNERSHIP FOR THE DESIGN OF A TITANIUM ALLOY BLOWER FAN WHICH IS RESISTANT TO VERY HIGH TEMPERATURES.

A **balanced** and **practical** contractual model

Contract research is at the heart of ARMINES' skills.

Its partner businesses provide financial support which covers a share of the full cost of projects.

The contracts are not services, but part of a public-private technical-economic partnership.

This set of circumstances creates reciprocal rights and obligations for the company and research centre:

- the right to exploit results in stakeholders' acknowledged areas of expertise;
- the right to publish and support theses;
- the legal sharing of intellectual property, for the purpose of developing a coherent intellectual heritage and the capacity for each partner to progress in their own field.

Balancing training, academic activities and contractual research is at the heart of ARMINES' management dynamics.

ITS AREAS OF RESEARCH COVER:

MATERIALS SCIENCE AND ENGINEERING

ENERGY AND PROCESS ENGINEERING

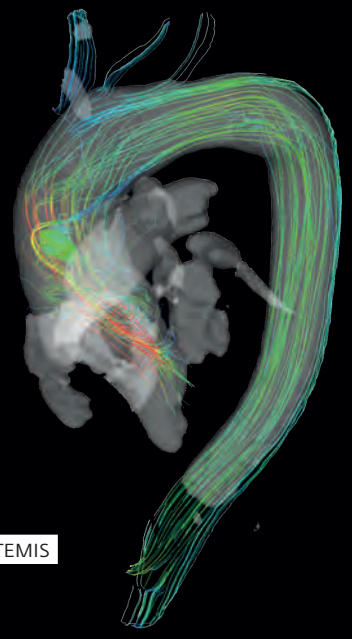
EARTH AND ENVIRONMENTAL SCIENCES

MATHEMATICS AND SYSTEMS

ECONOMY, MANAGEMENT AND SOCIETY

OVERVIEW OF A YEAR OF RESEARCH *FOCUSED ON SOCIO-ECONOMIC NEEDS*

Three prestigious European prizes to further **biomedical research**



AARTEMIS

CIS - MINES SAINT-ÉTIENNE / EUROPEAN RESEARCH COUNCIL (ERC)

Two grants amounting to €3.5 million were awarded by the ERC to Stéphane Avril and Pierre Badel at the MINES Saint-Etienne - ARMINES CIS (health and engineering centre) in 2015, for their AArteMIS and BIOLOCHANICS **aorta aneurysm detection and treatment projects.**

The objective of the **AArteMIS** project is to observe the details of the tissue's micro-structure to describe the mechanisms that precede and govern its rupture. Experimental and digital methods will then make it possible to establish quantitative criteria for rupturing at a microscopic level.

The ultimate objective of the **BIOLOCHANICS** project is to develop a completely innovative medical examination for patients likely to suffer from aortic aneurysms. Following this examination and thanks to the use of an interactive interface, surgeons and radiologists will be able to predict the risks of developing an aneurysm over several years and also determine the areas of tissue to target for preventive treatment.

CMP - MINES SAINT-ÉTIENNE / EUROPEAN RESEARCH COUNCIL (ERC)

The ERC also renewed its confidence in Róisín Owens at the beginning of 2015, by granting her an additional €150,000 for work on the **bio-electronic device** proof of concept developed as part of the **IONOSENSE*** project, to which it awarded a grant of €1.5 million in 2011. The device developed by Róisín Owen's team couples cell cultures with electronic equipment to measure the state of health and reactions of cells in real time when confronted with a medicine or different pathogens (viruses, toxins, bacteria). The particularly promising results could well change the face of future toxicology.

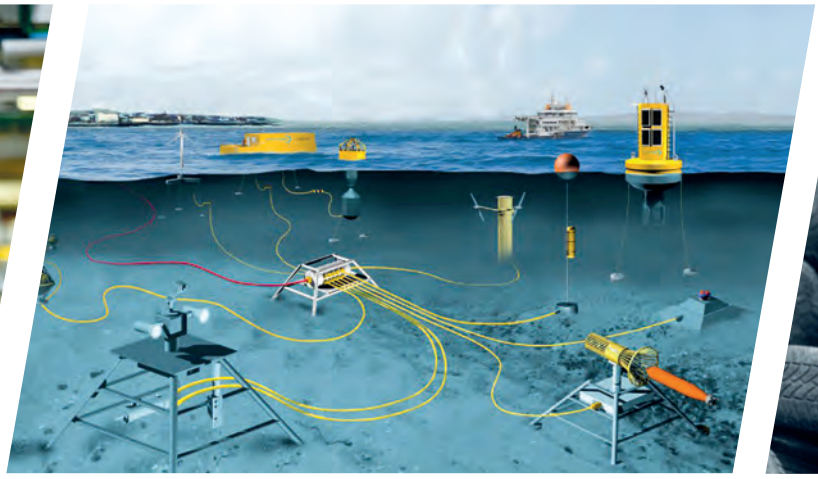
* Exploitation of Organic Electrochemical Transistors for Biological Ionsensing.

These projects have received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreements No 638804 – AArteMIS, No 647067 – BIOLOCHANICS and 665725 – IONOSENSE-POC).

European Research Council
Established by the European Commission

IONOSENSE

OVERVIEW OF A YEAR OF RESEARCH FOCUSED ON SOCIO-ECONOMIC NEEDS



An innovative process for manufacturing **composite parts for the automotive industry**

TPCIM - MINES DOUAI / FAURECIA AUTOMOTIVE SEATING

The MINES Douai TPCIM (Polymer and Composite Technology & Mechanical Engineering) department developed an integrated stamping and overmoulding process for Faurecia to manufacture thermoplastic composite parts for the automotive sector (seat bases, tailgates, boot lids, semi-structural parts, etc.). Combining the forming and injection stages in a single phase makes it possible to obtain parts which do not require alterations to appearance and meet manufacturers' specifications in terms of sturdiness and lightness. Better quality, production cost and cycle times are so many assets that won this 'one shot' process the **2016 JEC World innovation award.**

This solution will be featured by Faurecia in the second half of 2016 in response to consultations with customers. The mass production run is scheduled for the first half of 2018.

Shared information on **renewable marine energy resources**

O.I.E. - MINES PARISTECH / IFREMER / ADEME

The MINES ParisTech O.I.E. (Observation, Impact, Energy) Centre has a stake in the IREMARE project. This project financed by Ademe is focused on characterising renewable marine energy resources along the west coast of France. The information obtained (maps, tabular data) is made available on **an open database according to inter-operability principles,** ensuring that it can be widely distributed and used. The project is aimed at all stakeholders concerned by the characterisation of resources as renewable marine energies, and significantly contributes to the development of this emerging sector.

Creating a joint laboratory to **recycle tyres** and **composite materials**

RAPSODEE - MINES ALBI / ALPHA RECYCLAGE FRANCHE COMTÉ (ARFC)

MARVAPOL, a company devoted to recycling advanced materials by vapour thermolysis is the **joint laboratory** set up at the end of 2015 by the ARFC and the MINES Albi Rapsodee research centre. This laboratory is proof of the dynamism that connects the two partners and it aims to study the possibilities for processing and recycling as yet unprocessed industrial waste, particularly the billions of used tyres produced by the automotive industry.

Assessing the fire risk associated with the storage and **production of biofuels**

INSTITUT DES SCIENCES DES RISQUES (RISK SCIENCES INSTITUTE) - MINES ALÈS / TOTAL

The Institut des sciences des risques de MINES Alès is working in partnership with Total Raffinage France to **study the combustion mechanisms and risks associated with the storage and use of biodiesel loads and HVO *(Hydrotreated Vegetable Oil)* products.** This research is part of the €200 million investment by the Total group to make the La Mède platform one of the largest bio-refinery in Europe to meet the growing demand for biofuels in controlled security conditions.

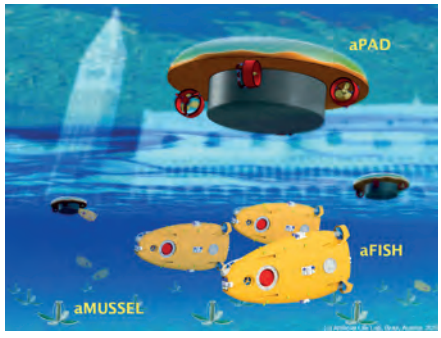
Electric sense and **biorobotics** to the rescue of the Venetian lagoon

DAPI - MINES NANTES / H2020 EUROPEAN PROGRAMME

Electric sense bio-roboticists at the MINES Nantes' automatic, control and production systems and IT (DAPI - IRCCyN) department are partners on a four-year European research project called 'subCULTron'*. The objective is to build an ecosystem with three populations of robots capable of collaborating with each other: **artificial mussels,** set down on the seabed, to detect the evolution of the biophysical parameters of the Venetian lagoon; a **group of water lilies** floating on the surface to communicate with the project's human operators, and **a school of artificial fish** which act as a vehicle for the mussels and as an energy and information vector between the mussels and water lilies. MINES Nantes will provide its expertise in **biomimetics** to facilitate the collaboration and communication between robots through electric field emissions.

*Universities of Graz (Austria), Brussels (Belgium) and Zagreb (Croatia), and the Sant'Anna School of Advanced Studies (Italy).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640967



OVERVIEW OF A YEAR OF EXCHANGES WITH VALUE PROPOSITION COMPANIES

PILOTE HYDROGÈNE PLATFORM

+ 2,000 NEW CONTRACTS SIGNED IN 2015

93 ACTIVE EUROPEAN PROJECTS

211 ACTIVE ANR (FRENCH NATIONAL RESEARCH AGENCY) CONTRACTS

116 DEVELOPMENT AGREEMENTS

113 PATENTS

77 LICENCES IN USE

51 SOFTWARE PROGRAMMES DEVELOPED

48 RESEARCH CENTRES

ENSTA PARISTECH / MINES PARISTECH / MINES NANTES

Launching a **platform dedicated** to the **exploitation of hydrogen for vehicles**

The new Pilote Hydrogène platform is the result of a collaborative project and incorporates **all stages of the 'hydrogen energy' sector,** from production, purification, storage, through to the restitution of energy by direct combustion or by fuel cells. Designed by the ENSTA ParisTech Chemistry & Processes unit, in collaboration with other Institut Carnot M.I.N.E.S teams (PERSEE, Thermodynamics of processes Centre and Materials Centre for MINES ParisTech, and the MINES Nantes energy systems and environment department), it is already getting interest from manufacturers.

MEETINGS WHERE RESEARCHERS PRESENT THEIR VALUE PROPOSITIONS

At the heart of the policy of expanding the **portfolio of partners**

ARMINES organises **manufacturer meetings** to promote the expertise of the joint research centres' researchers to new companies. The '5 to 7' format favours dialogue with company representatives while highlighting the skills of research staff. For example, the Institut Carnot M.I.N.E.S' ACLAME programme offering access to the skills of 6 Écoles des Mines in **additive manufacturing** brought together several industrial operators in September 2015 at MINES Douai who are keen to innovate and to set themselves apart thanks to our know-how: different materials (metals, alloys, composites, thermoplastics), different processes (3D printing, SLM, etc.), modelling, etc.

https://youtu.be/W2pzv_Sdzlw

TEAMS ATTENTIVE TO THE NEEDS OF COMPANIES

A **team dedicated** to the energies of the future

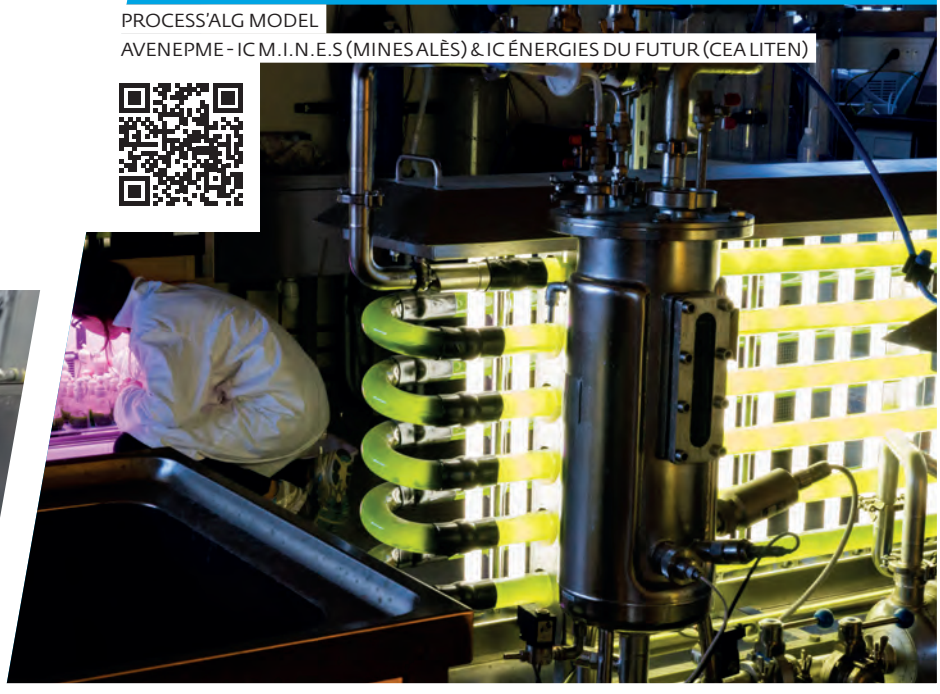
In order to support the development of partnership relations, ARMINES has appointed a team to the AVENEPME programme led by the Institut Carnot M.I.N.E.S and devoted to the energies of the future. The canvassing of more than 700 SMEs and middle-market companies has led to some 400 expressed requirements listed in a CRM.

AVENEPME has made it possible to finance **40 technological models** establishing a proof of concept to stimulate the technological transfer to SMEs/middle-market companies in many sectors:

- biomass and waste recovery;
- calculation and energy simulation;
- cold and hot production;
- renewable energies;
- frugal factory.

The partnerships resulting from this system have generated turnover of almost €1 million for the whole consortium.

www.avenepme.eu



PROCESS'ALG MODEL
AVENEPME - IC M.I.N.E.S (MINES ALÈS) & IC ÉNERGIES DU FUTUR (CEA LITEN)

REFHYB MODEL
AVENEPME - IC M.I.N.E.S (CES MINES PARISTECH)

ARMINES - COLLABORATIVE ACADEMIC RESEARCH

From research to technological transfer, nearly 600 private individuals in service of a mission shared with the Écoles des Mines.

MANAGEMENT OF THE INDUSTRY-RESEARCH RELATIONSHIP

52 *permanent staff in charge of management*

Drafting and managing collaborative research, direct manufacturer, public or European contracts.

Supporting research teams.

Intellectual property strategy.

Support roles (HRM, accounting, finance, legal).

PERMANENT STAFF IN RESEARCH CENTRES

215 *teacher-researchers, research engineers, technicians and administrative staff*

Permanent staff shared with parners schools within joint research centres.

High-level sustainable skills.

Cutting-edge technological, metrological and software platforms at the heart of the research centres.

TRANSVALOR - A SUBSIDIARY FOR CREATING RESEARCH-BASED BUSINESS

50 *permanent staff in charge of development*

Support for technological maturation and industrial and commercial development projects.

Industrialisation, support and marketing of technical and scientific software produced by the research centres.

Acquiring a stake in and supporting spin-off technologies.

TRANSVALOR

A VEHICLE FOR TRANSFERRING INNOVATION THROUGH SKILLS

281 *PhD students, post-doctorate fellows and fixed-term contract employees*

Training through research, keeping up with industrial and economic issues.

Learning a dual culture.

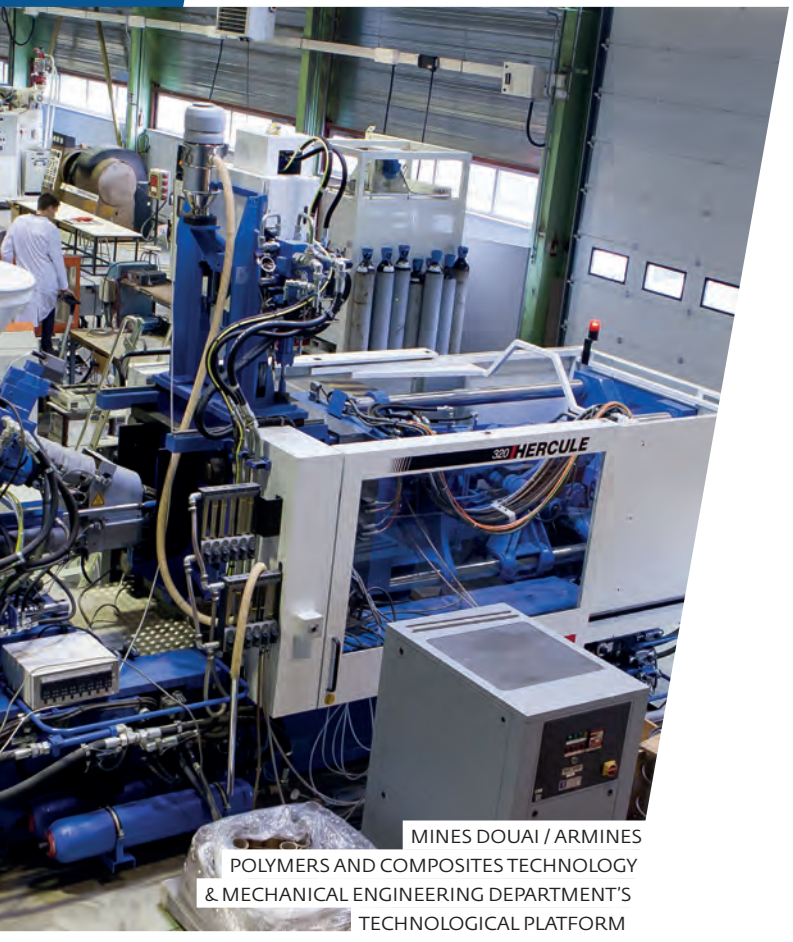
A springboard for PhD students and post-doctorate fellows.

A breeding ground for innovation in businesses.

ARMINES offers PhD students with contracts the opportunity to confront issues of economic interest. As such, it plays the role of a 'jobs springboard' for more than 100 PhD students each year hired on private contracts.

ACADEMIC BUSINESS RESEARCH CENTRES

The 'ARMINES-Schools' public-private partnership is very flexible and ensures a high level of reactivity. Depending on the nature of the research and the expectations of its partners, ARMINES and the schools form aptly-chosen, customised project teams and complete the State's resources in terms of investment, functioning, logistics and human resources.



MINES DOUAI / ARMINES POLYMERS AND COMPOSITES TECHNOLOGY & MECHANICAL ENGINEERING DEPARTMENT'S TECHNOLOGICAL PLATFORM

Joint ARMINES-schools **centres**

Each centre has its own skill, a scientific department with, in terms of management, the objective of annually balancing its operating account while ensuring its actions are part of its school's strategic objectives.

An **entrepreneurial approach**

ARMINES has a very flat structure which functions according to the principle of initiative and accountability under demanding economic constraints. The scientific teams themselves are in an 'entrepreneurial' situation with fixed costs not covered by the State's budget.

Taking all expenditure (including payroll) together, some ARMINES/MINES ParisTech joint research centres operate on practically 50% budget funds and 50% contractual resources. This constitutes something of an oddity within the French higher education and research landscape.

Our heads of centre combine scientific excellence in internationally recognised teams with consideration of the socio-economic needs.

Research structured around **technological** and **software platforms**

The research partnership is based in part on the implementation and development of scientific results in experimental, metrological, IT or software platforms, the idea being to turn a scientific breakthrough into a result which can be exploited by the industrial world.

The close link between high-level scientific skills and these technological platforms that put ideas into practice under the supervision of qualified permanent staff, makes it possible to go from the idea to the proof of concept on a trial version. The companies thus remove some of the risk prior to setting their product development in motion.

An **international** dimension

Half of the partnership research activity is directly conducted with the companies, 15% of which are foreign companies.

INSTITUT CARNOT M.I.N.E.S

AN INSTITUT CARNOT - APPROVED ORGANISATION

The Institut Carnot label recognises the capacity of public research organisations to put partnership research at the heart of their strategy. The Écoles des Mines under the supervision of the French Ministry of the Economy, Industry and Digital Affairs together with the ARMINES association obtained the Institut Carnot M.I.N.E.S* label in 2006. When it was renewed in 2011, its structure was consolidated by incorporating the École Polytechnique Université Paris Saclay and ENSTA ParisTech laboratories.

https://youtu.be/4uyefobyAQo

The Carnot label is awarded to public research organisations which simultaneously lead upstream research activities, aimed at renewing their scientific and technological skills, and a proactive policy in terms of partnership research which benefits the socio-economic world. For this, they must:
- anticipate the needs of companies;
- form closer links with private research stakeholders.

The implementation of this roadmap is facilitated by the payment of a contribution which finances:
- scientific resourcing work;
- initiatives to structure partners' research.

In 2015, the Institut Carnot M.I.N.E.S' partnership research amounts to €28.1 million, including 75% of the revenue from direct contracts financed by stakeholders from the socio-economic sector. All of the contractual activity is managed by ARMINES.

At the end of 2015, the Institut Carnot M.I.N.E.S applied to be re-approved for five years by setting out new objectives:
- vertical structuring of the research offer (by structuring scientific fields within sectors of economic demand);
- consolidation and breakdown of skills into value chains;
- increased value given to research results.

* *Méthodes InNovantes pour l'Entreprise et la Société*
(Innovative Methods for Companies and Society).

FUTURE INVESTMENTS PROGRAMME: THE INSTITUT CARNOT M.I.N.E.S IS PRESENT IN 6 OUT OF THE 8 SECTORS SELECTED

The research centres which are members of the Institut Carnot M.I.N.E.S have had resounding success in the call for 'Sector' projects supported by the 'Promotion - Instituts Carnot' future investments programme run by the ANR (French national research agency).

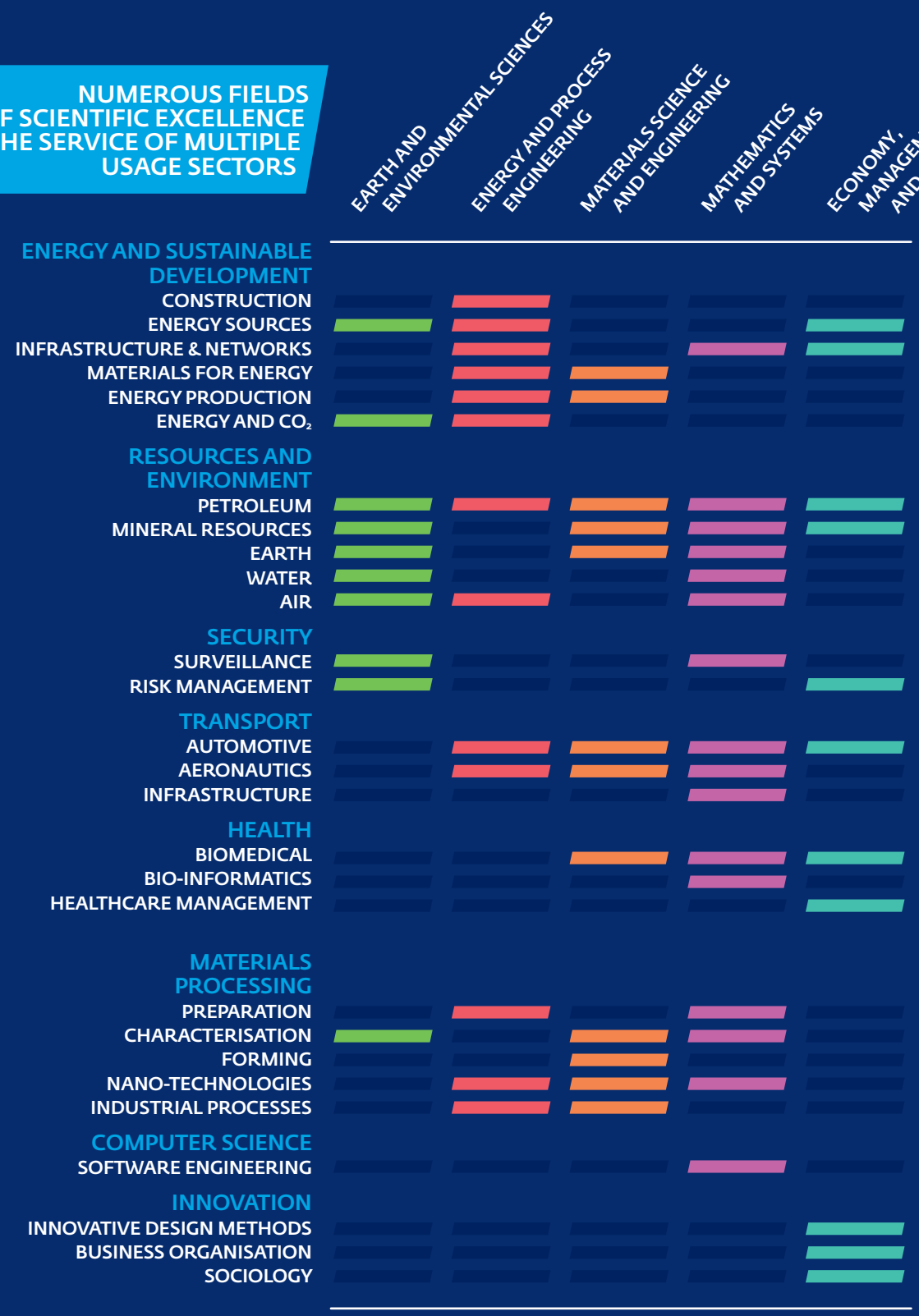
It involves creating innovation ecosystems aimed at SMEs, by sector of economic demand, incorporating a research offer, training, and technological platforms for the sectors:

1. Fashion & Luxury (CARATS) (leader IC M.I.N.E.S)
2. Aeronautical construction (AirCar) (leader IC ONERA)
3. Extractive and Primary processing industries (EXTRA&Co) (leader IC ISIFOR)
4. Eco-industries/Renewable energies (EnergICs) (leader IC Energies of the Future)
5. Mechanical industries and processes (IMP) (leader IC CETIM)
6. Health - Medicines (FINDMED) (leader IC ICM)

Among these sectors, the Institut Carnot M.I.N.E.S will head the CARATS sector, which aims to support SMEs and middle-market companies in the fashion and luxury industries to gain access to high added-value niches with greater content in terms of innovation.

The Institut Carnot M.I.N.E.S boasts more than **2,400 research staff** including **800 PhD students** in **40 laboratories** across **5 cross-school** departments

NUMEROUS FIELDS OF SCIENTIFIC EXCELLENCE IN THE SERVICE OF MULTIPLE USAGE SECTORS



MATURATION, TECHNOLOGY TRANSFER AND START-UP

Transvalor's mission: to transform research results into innovation

Transforming research software into industrial code

ARMINES is the reference shareholder in TRANSVALOR SA destined to lead the process of transforming research results into innovation. **'Maturation'** is the intermediate stage between the research and the market.

TRANSVALOR fulfils this mission either internally or externally with a stake in **spins-off based on technologies of the research centres,** mainly in the field of technical software.

In 2015, TRANSVALOR (more than 50 employees) had a turnover of €7.5 million, mostly in the field of industrialisation and marketing of scientific simulation software for material forming (simulation of different forging and casting processes in particular) produced by CEMEF (ARMINES/MINES ParisTech joint centre) in Sophia Antipolis. The REM3D software was launched commercially in 2015 (in the field of polymers) and is particularly innovative in terms of injecting polymer foams.

This area of activity called 'Transvalor Material Forming' led by Emmanuel Chenot since April 2016, which has a subsidiary in the USA, generates nearly 70% of its turnover through exports with strong presence in Asia.

Delivering results more applicable to Industry

More generally, TRANSVALOR launches new research centre activities by creating an Innovation department (called 'Transvalor Innovation' managed by Etienne Wey) responsible for the maturation of projects.

This internal TRANSVALOR activity functions as a virtuous circle, which has the effect of reinforcing the ability of companies to use the results and thus bolster the research itself and its socio-economic impact.

Within the context of the joint centres with MINES ParisTech, the following stand out:

- industrialisation of the **SODA** web service portal and **HELIOCLIM** solar radiation database developed at the O.I.E centre;
- simulation of the transfer of fluid in porous environments that take geochemical exchanges into account (**CHESS** and **HYTECH** software developed at the Geosciences Centre);
- development of the Mathematical Morphology Centre's **MORPH-M** image analysis software.

In 2014 and 2015, TRANSVALOR invested heavily in supercomputing to simulate interaction between fluids and structures, using a highly innovative 'fluid-structure' simulation model developed at CEMEF (Material forming centre) coupled with an original SaaS-mode calculation platform developed by TRANSVALOR (**Aéromines** project).

Transvalor Innovation now handles distribution of the **Z-set** structural calculation code developed at the Évry (MINES ParisTech/ARMINES) materials centre.

For each of these software developments, TRANSVALOR contributes to the development of codes and their industrialisation, and provides user interfaces and the technical support.

Supporting research centre spin-offs

TRANSVALOR uses a share of its own capital to provide seed capital in the first round of funding in particular. In 2015 it was a shareholder in the following companies:

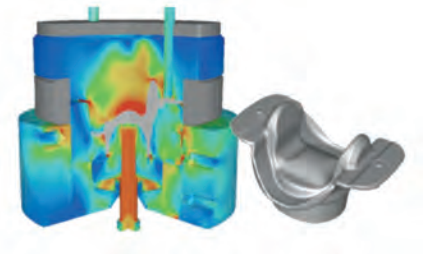
- **GÉOVARIANCES** (geostatistics, MINES ParisTech);
- **Ai4r** (medical imaging, MINES Nantes);
- **EAYSVIRT** (data centres' management of calculation resources, MINES Nantes);
- **Terra 3D** (3D imaging for local authorities, Robotics, MINES ParisTech).

In 2014, TRANSVALOR acquired a stake in the Norwegian company **CEETRON**, a specialist in man-machine interfaces and the 3D visualisation of calculation results.

https://youtu.be/JjqPPwP903M

EXAMPLES OF SOFTWARE MARKETED BY TRANSVALOR

- **FORGE** software, developed by the CEMEF (MINES ParisTech - ARMINES joint centre), is a cutting edge simulation tool for the forging industry. It is the ideal software solution to simulate hot and cold forming processes.



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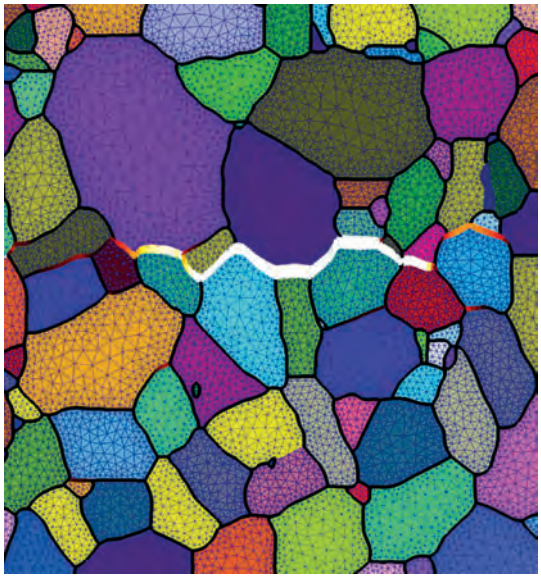
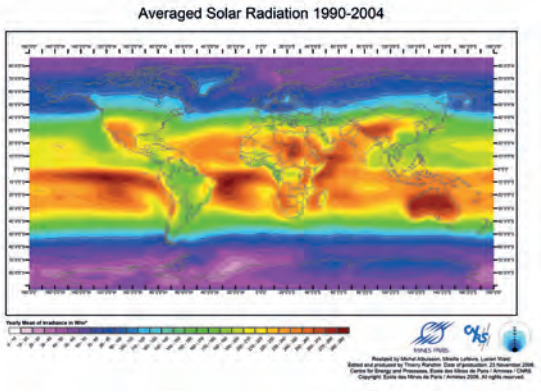
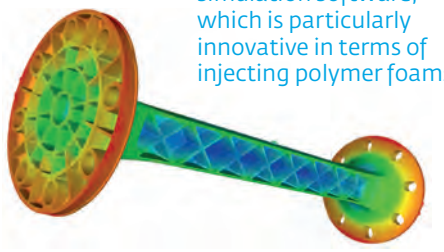


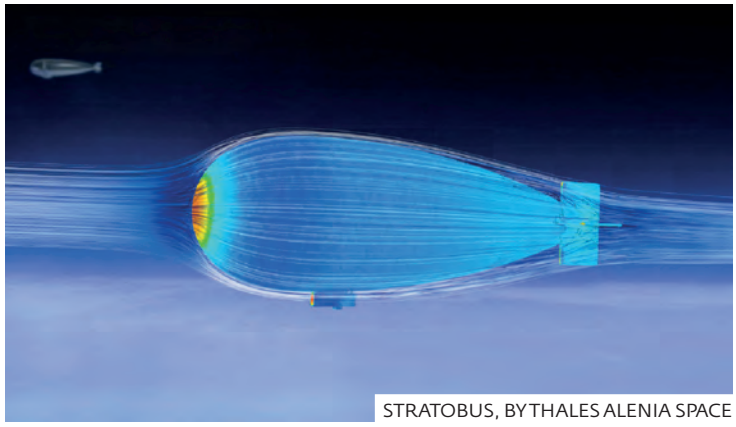


- Industrialisation of the **SODA** web service portal and **HELIOCLIM** solar radiation database developed at the O.I.E. (MINES ParisTech/ ARMINES) centre.

- The **REM3D** software launched commercially in 2015 is polymer material injection process digital simulation software, which is particularly innovative in terms of injecting polymer foams.



- The **Aéromines** project developed by the CEMEF (MINES ParisTech/ARMINES Material forming centre) follows on from the major investment initiated in 2014 in supercomputing to simulate interactions between fluids and structures. The platform is operational in 'cloud' mode and in real time.



STRATOBUS, BY THALES ALENIA SPACE

TRANSVALOR is a shareholder in **PERTINENCE INVEST**, an investment company created with private 'sister' companies (INSAVALOR, INPG ENTREPRISE, CENTRALE INNOVATION, ADERA, ARTS, ADRINORD, VALOR PACA) to pool financial resources and skills to support start-ups promoting the technologies of engineering schools' and partner universities' laboratories. By the end of 2015, PERTINENCE INVEST had acquired an equity stake in around ten start-ups. Finally, TRANSVALOR handles **Presses des Mines**' publishing with around thirty new titles published each year ('Transvalor Edition').

2015 FIGURES

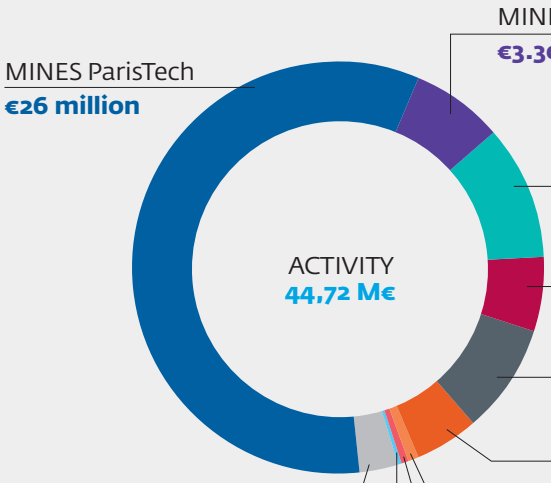
COMPARATIVE ACTIVITY

2015 : **€44.72 million**

2014 : **€45.10 million**

2013 : **€44.68 million**

TOTAL ACTIVITY PER PARTNER SCHOOL IN 2015



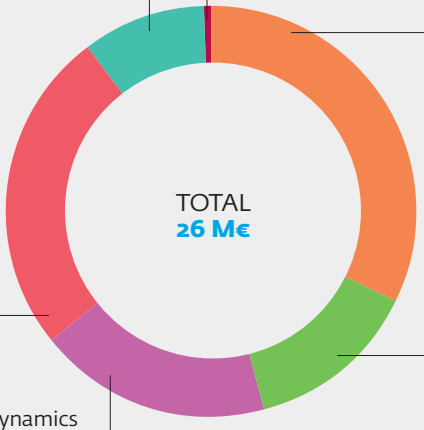
- MINES Saint-Étienne **€3.30 million**
- MINES ParisTech **€26 million**
- MINES Douai **€4.74 million**
- MINES Alès **€2.51 million**
- MINES Nantes **€3.92 million**
- MINES Albi **€2.25 million**
- Polytechnique **€0.33 million**
- ENSTA ParisTech* **€0.27 million**
- ENPC** **€0,07 million**
- Miscellaneous*** **€1.33 million**

* ENSTA ParisTech (École nationale supérieure de techniques avancées - French National School of Advanced Engineering)

** École des Ponts ParisTech (École nationale des ponts et chaussées)

*** including European consortia management resources

MINES PARISTECH CENTRES' ACTIVITY 2015



Economics, Management, Society
€2.53 million

- Cerna (Industrial Economics Centre) ● €0.34 million
- Crisis and Risk Research Centre □ €0.74 million
- Management Science Centre ● €1.12 million
- Innovation Sociology Centre ● €0.33 million

Others €0.08 M€

Materials Sciences and Engineering
€8.39 million

- Solids Mechanics Laboratory €0.26 million
- Material Forming Centre □ €3.56 million
- Materials Centre ★ €4.57 million

Energy and Process Engineering
€6.64 million

- Isige (Environmental Engineering and Management Centre) ■ €0.27 million
- Centre of Thermodynamics of Processes ■ €0.78 million
- Centre Observation, Impacts, Energy □ €0.76 milion
- Centre for Processes, Renewable Energies and Energy Systems □ €1.75 million
- Centre for Energy Efficiency of Systems ▸ €3.08 million

Earth and Environmental Sciences
€3.55 million

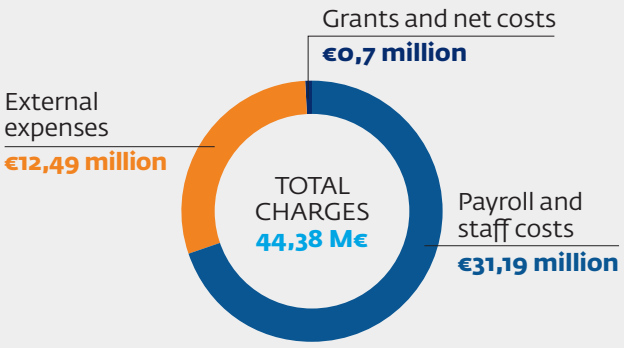
- Geosciences Centre ■ €3.55 million

Mathematics and Systems
€4.81 million

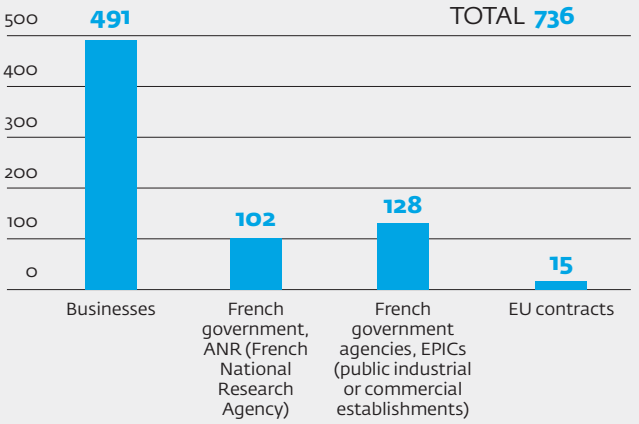
- Bio-informatics Centre ■ €0.81 million
- Mathematical Morphology Centre ■ €0.91 million
- Applied Mathematics Centre ■ €0.81 million
- Automation and Systems Centre ■ €0.38 million
- Computer Science Research Centre ■ €0.28 million
- Robotics Centre ● €1.62 million

★ Évry
■ Fontainebleau
▸ Palaiseau
● Paris
□ Sophia Antipolis

BREAKDOWN OF EXPENDITURE 2015



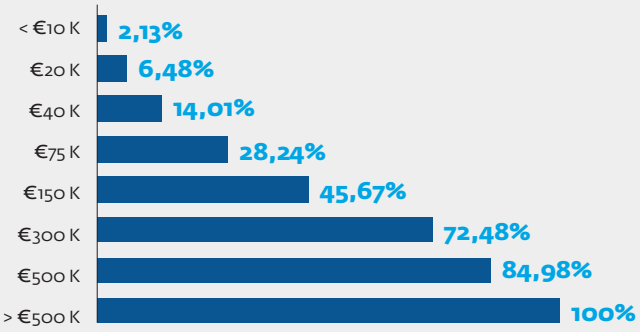
NUMBER OF NEW CONTRACTS PER FINANCER IN 2015



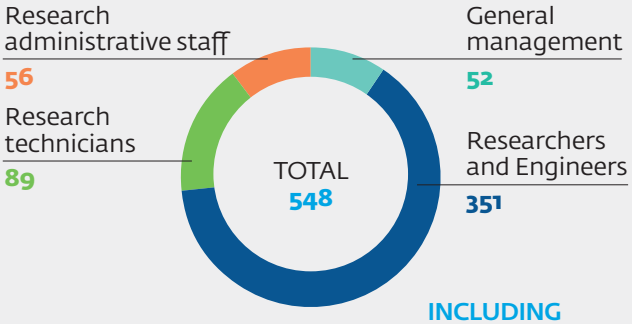
STAFF PER ESTABLISHMENT

	2013	2014	2015
PARIS	94	89	**95**
ALBI	35	34	**32**
ALES	30	36	**36**
DOUAI	67	57	**58**
ÉVRY	67	65	**60**
FONTAINEBLEAU	64	71	**64**
NANTES	42	49	**52**
PALAISEAU	34	33	**35**
SAINT-ÉTIENNE	35	39	**43**
SOPHIA ANTIPOLIS	72	84	**69**
PAU	3	3	**3**
MARNE-LA-VALLÉE	1	1	**1**
Total	**544**	**561**	**548**

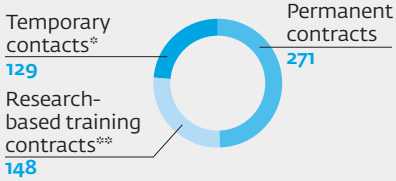
DISTRIBUTION BY SIZE OF CONTRACTS IN 2015



STAFF ON 31 DECEMBER 2015



INCLUDING



* Temporary contracts: Temporary contracts, traineeship, professionalisation contract, salaried trainee

** Ph.D. students on research-based training contracts

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AiCarnot: Association of Instituts Carnot

ARMINES represents Institut Carnot M.I.N.E.S (6 Écoles des Mines under the supervision of the Ministry of the Economy Industry and Digital Affairs and ARMINES) within AiCarnot and has a seat on the Board of directors.

> www.instituts-carnot.eu

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> www.curie.asso.fr

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Front cover: the Gardanne clean room where two innovative processes are developed by the Centre de microélectronique de Provence's (Provence microelectronics centre) PS2 department - MINES Saint-Étienne - ARMINES to develop flexible printed electronics.
© Contextes

https://youtu.be/JjqPPwP903M

Video on the work done at Gardanne on flexible printed electronics.

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