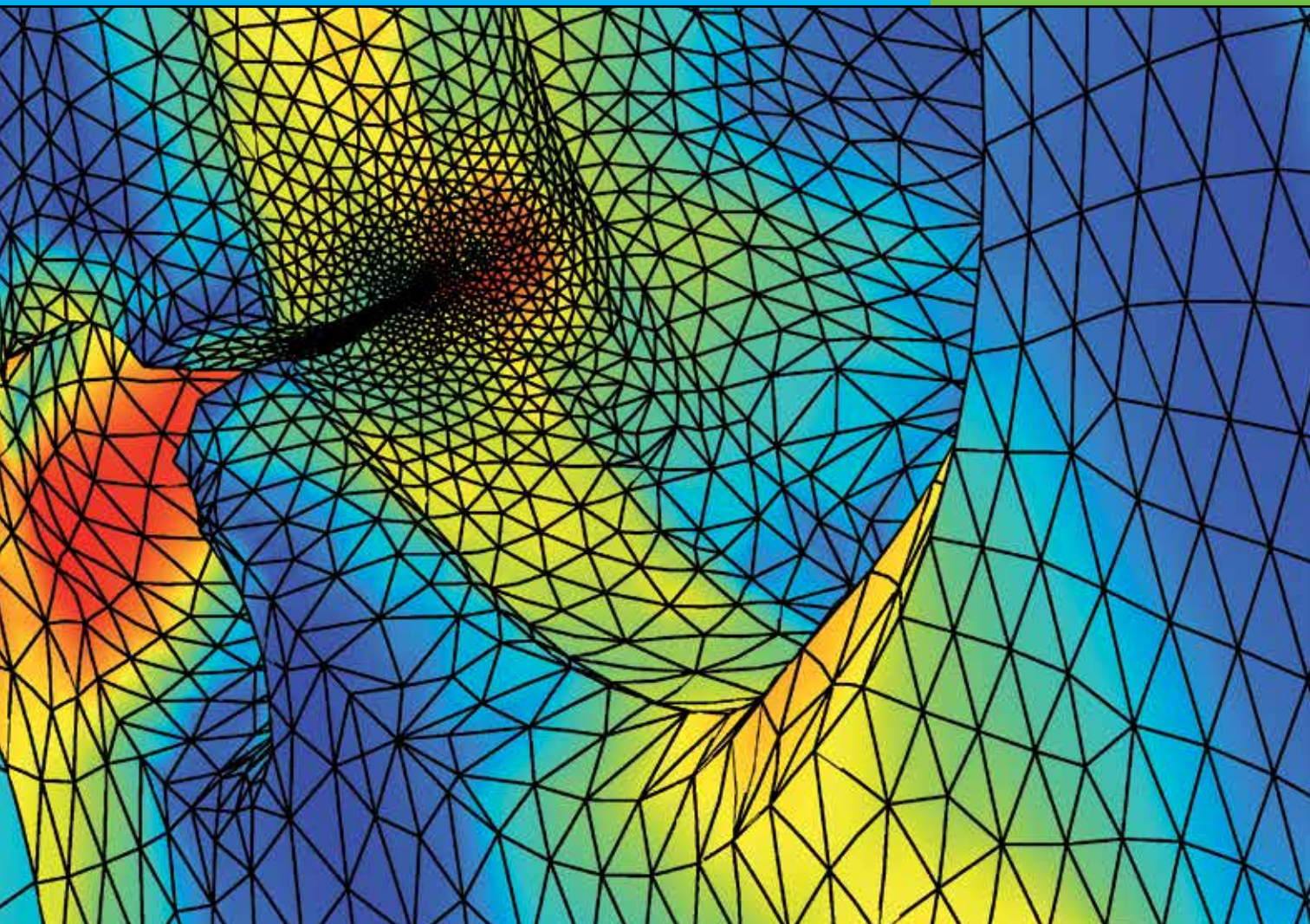




A LEADING INNOVATOR THROUGH COLLABORATIVE RESEARCH

2013-2014



MANAGEMENT OF INDUSTRY RESEARCH RELATIONSHIP

40 permanent staff members in charge of management

- Drafting and management of collaborative, direct industrial and public or European collaborative research contracts
- Supporting research teams
- Intellectual property strategy
- Support roles (HRM, accounting, finance and legal)

PERMANENT STAFF IN RESEARCH CENTRES

250 teachers-researchers, research engineers, technicians and administrative staff

- Permanent resources shared with schools within common research centres
- High-level sustainable skills
- Cutting-edge technological, metrological and software platforms at the heart of the common research centres

A VEHICLE FOR TRANSFERRING INNOVATION THROUGH SKILLS

250 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

TRANSVALOR - A SUBSIDIARY FOR CREATING RESEARCH-BASED BUSINESS

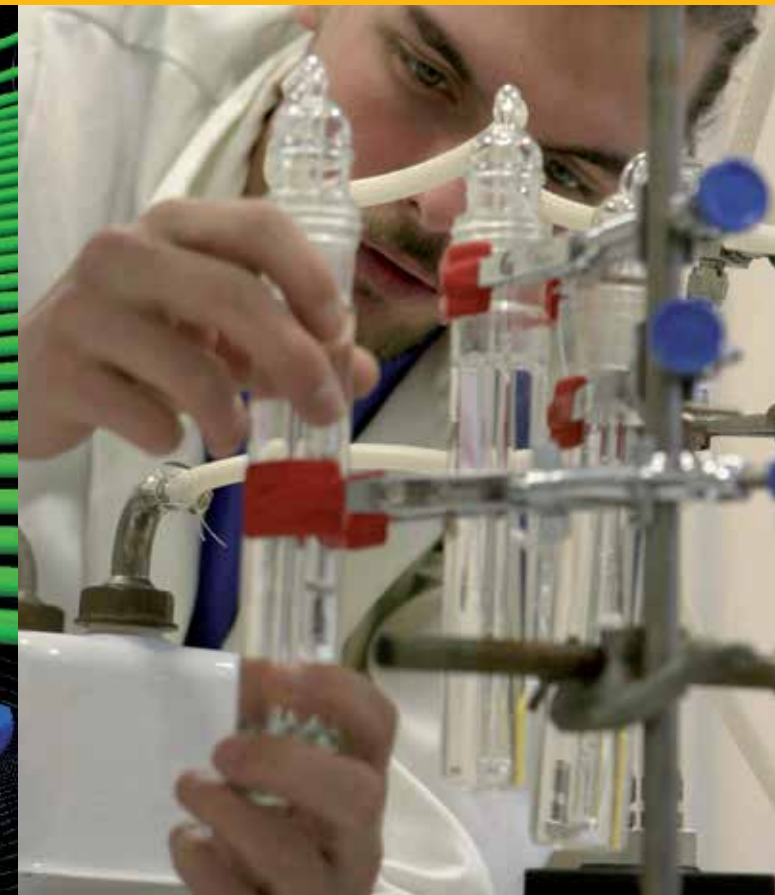
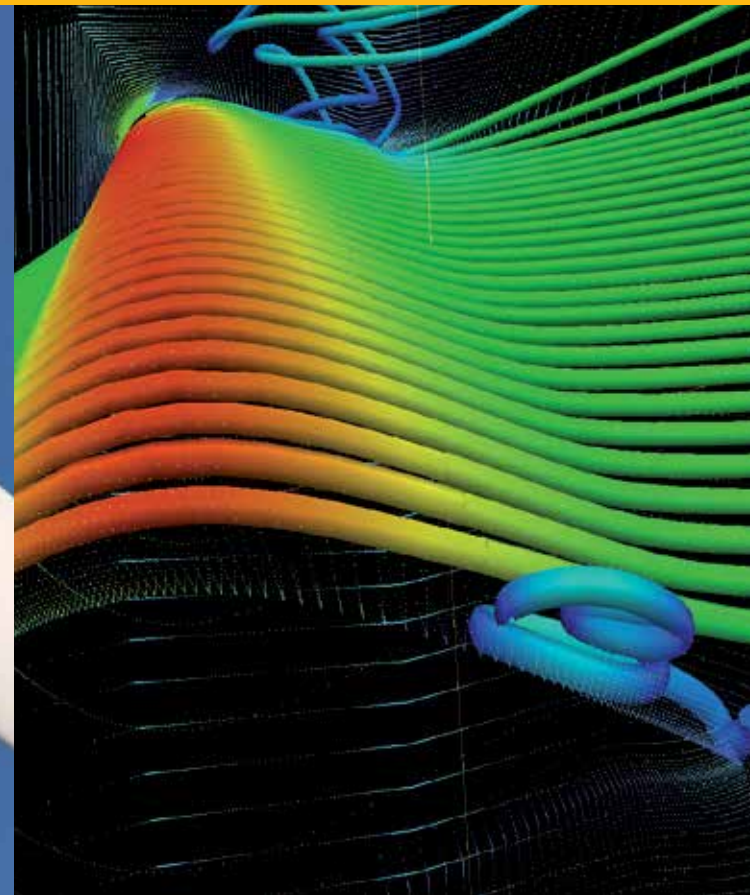
45 permanent staff members in charge of commercialisation

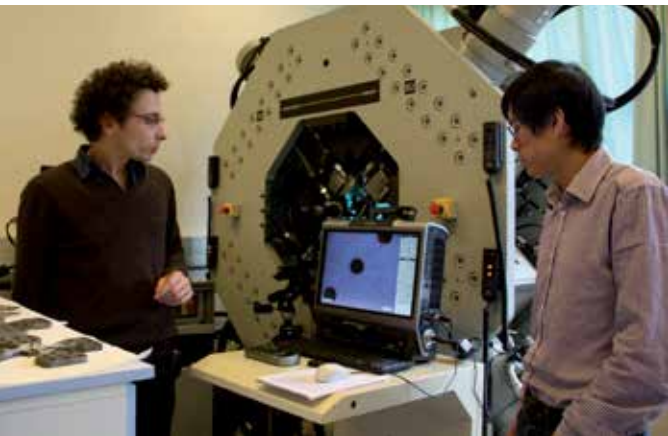
- Management of technological maturation and industrial and commercial development projects
- Industrialisation, support and commercialisation of technical and scientific software produced by the research centres
- Acquiring a stake in and supporting spin-off technologies

ARMINES

COLLABORATIVE ACADEMIC RESEARCH

From research to technological transfer, nearly 600 private-sector staff members are working on a shared assignment with the *Écoles des mines* network.





Development of new materials for the aeronautical industry. A partnership between ARMINES - MINES ParisTech's Materials Centre and the Snecma- SAFRAN Group to design a ducted fan with a titanium alloy which is resistant to very high temperatures.

Watch the web-report on www.armines.net



Editorial

Year after year we move forward and are confronted with new challenges.

The world of higher education continues to regroup so that it can become stronger in terms of international competition. At the same time the world of research and its exploitation remains dispersed and there are even new stakeholders.

Against this background, ARMINES and its partner schools form a coherent and effective team built on decades of successful academic research driven by economic and social demands.

The experience of the Industry-Research relationship in France constitutes a valuable basis which ARMINES relies on in order to continuously innovate.

The schools-ARMINES partnership has cutting-edge scientific resources and produces relevant and exploitable research results.

This is what distinguishes us. It is at the heart of the training, research and innovation triangle. It gives large international universities and leading technological transfer structures across the world their power and reputation.

Many thanks to the women and men who work towards this goal and its success. They can be proud of the economic results and academic reputation of their collective work. They have sealed the reputation of the Écoles des Mines and ARMINES in our country and well beyond.



Robert Brunck
President



Pascal Iris
Director



Drill head with PDC drill bits

The ARMINES - MINES ParisTech Materials and Géosciences Centres collaborate with the Varel Europe company to improve the performance of drilling tools at significant depths and the life span of their PDC-type (Polycrystalline Diamond Compact) drill bits by increasing both resistance to wear and tear through abrasion from the parts which grate (diamond and cemented carbide inserts) and resistance in the centre of the PDC drill bit.

Watch the web-report on www.armines.net



ARMINES

An identity based on initiative and accountability

A private-sector organisation dedicated to contract research

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

ARMINES is bound by French government-approved agreements to its partner schools, chief amongst them being MINES ParisTech and the *Écoles des Mines* network under the supervision of the French Ministry for Productive Recovery: Albi-Carmaux, Alès, Douai, Nantes and Saint-Étienne. ARMINES 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, thereby empowering the research centres to deal effectively with the economic world: the ability to decide, make commitments and react quickly, unfettered by bureaucratic red tape, allows the organisation to undertake the kind of activity in which researchers must in fact have a free hand.

Staffed by 544 of its own employees, ARMINES assists with the development of research centres it shares with its partner schools.

A balanced and practical contract model

Contract research is at the heart of ARMINES' skills. The partner businesses provide financial support which covers a share of the full costs 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 the research centre:

- The right to exploit results within the areas where each partner may lawfully act
- The right to publish and support theses
- The legal sharing of intellectual property for the purpose of developing a coherent intellectual heritage and a capacity for each partner to progress in their own field.

All of these provisions allow the principle of open innovation to flourish in a win-win scenario.

One of ARMINES' missions is to monitor the quality of this balance on a contract by contract basis.

→ More than 45 years of collaborative research and skills transfer

→ Leading collaborative research organisation in France

→ €45 million of contract activity in 2013



The research centres

The academic oriented to industry centres

The ARMINES-schools common research centres

In keeping with the nature of collaborative research, the operational unit is the research centre, jointly managed by ARMINES and the partner engineering school, where ARMINES makes its own resources available in terms of personnel, investment and day-to-day running, on a scale commensurate with the level of contract income generated.

ARMINES disposes of permanent private sector staff, particularly research engineers, specialized technicians and administrative staff, who complement the public sector employees within the research centres in a form of “functional complementarity” between ARMINES and the schools. This makes robust collaborative research possible and lends cohesion to the whole structure.

Research structured around technological and software platforms

Indeed collaborative research relies for a large part on the implementation and development of scientific results in experimental, measurement, computer science or software platforms, allowing a scientific discovery to be transformed into a result which can be used by industry.

ARMINES also helps bring in researchers, PhD students and post-doctoral fellows from abroad. In this way it gives the research centres the resources to develop and adapt to their environment.

Each centre has its own specific area of expertise and autonomous scientific management structure whose objective is to keep its annual operating account in balance, while ensuring that its activities are in line with the strategic objectives of the school.

Entrepreneurial simulation

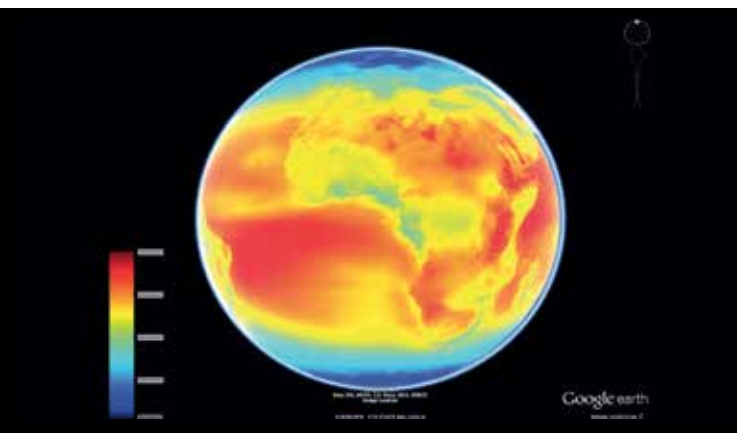
ARMINES therefore has a very flat structure which functions according to the principles of initiative and accountability under demanding economic constraints. For example, taking all expenditure (including payroll) together, some ARMINES-MINES ParisTech common research centres operate on practically 50% budget funds and 50% contractual resource.

The scientific teams themselves are thus placed in an “entrepreneurial” situation with significant fixed costs not covered by the French government’s budget, which constitutes something of an oddity on the French higher education and research landscape.

The balance between training, academic activity and contractual research lies at the heart of the laboratory dynamics.

The joint research teams shared by ARMINES and the schools are active in most fields of engineering science as well as in economics and management

- **Earth and environmental sciences**
- **Energy and process engineering**
- **Materials science and engineering**
- **Mathematics and systems**
- **Economics, management, society**



The innovative E-CARE project focuses on the design and testing of a Fresnel linear-type thermodynamic solar power plant technology prototype in the making and on precisely predicting the corresponding solar resource through a combination of field measurements and satellite estimates. This project is managed by the MINES ParisTech ARMINES O.I.E Centre in partnership with the companies CNIM, Transvalor and Bertin Technologies and is co-financed by ADEME (French Agency for Environment and Energy) and *les Investissements d’Avenir*.

Watch the web-report on www.armines.net





Applying ARMINES - MINES ParisTech's Scientific Management Centre's C-K 'innovative design' method to update the new cockpit of the future - ODICIS - designed by Thales Avionics.

Watch the web-report on www.armines.net



At the heart of Institut Carnot M.I.N.E.S.*



The leading academic Carnot institute with more than 2,000 research staff including 800 PhD students in 5 cross-school departments

A collaborative research label

ARMINES and the *Écoles des Mines* (which come under the authority of the French Ministry of Productive Recovery) were first granted the Institut Carnot seal of approval in 2006.

In April 2011, the *Institut Carnot M.I.N.E.S* won the renewal bid and will therefore benefit for another five-year period from the Carnot label and was exented to some Polytechnique Paris-Tech and ENSTA ParisTech laboratories.

A catalyst for scientific resourcing

Against this background, an annual contribution from the ANR (French national research agency) allows upstream exploratory work to be funded for the purposes of laying the groundwork for future collaborative research. This contribution also makes it possible for "professionalisation" initiatives to be carried out with a view to strengthening links with businesses.

The research applications cover a large number of economic and social disciplines, with more than 180 key skills identified, available on the Institut Carnot M.I.N.E.S website.

→ www.carnot-mines.eu

* Innovative Methods for Companies and Society

AVENEPME - increasing the competitiveness of SMES

In partnership with Carnot Energies of the Future, Carnot M.I.N.E.S was one of 3 beneficiaries of the 2012 'Carnot SMES' call for projects financed out of ANR-PIA funds. This project makes it possible to increase the number of direct partnerships between innovative medium-sized and small businesses and research centres in the field of energies of the future. This association between the two Carnot institutes offers businesses complete coverage in terms of energy chains and innovation.



Distribution of scientific skills by field of research and application	EARTH AND ENVIRONMENTAL SCIENCES	ENERGY AND PROCESS ENGINEERING	MATERIALS SCIENCES AND ENGINEERING	MATHEMATICS AND SYSTEMS	ECONOMICS, MANAGEMENT, SOCIETY
ENERGY & SUSTAINABLE DEVELOPMENT					
CONSTRUCTION					
SOURCES OF ENERGY					
INFRASTRUCTURES & NETWORKS					
MATERIALS FOR ENERGY					
ENERGY PRODUCTION					
ENERGY AND CO ₂					
RESOURCES AND ENVIRONMENT					
PETROLEUM					
MINERAL RESOURCES					
EARTH					
WATER					
AIR					
SECURITY					
SURVEILLANCE					
RISK MANAGEMENT					
TRANSPORT					
AUTOMOTIVE					
AERONAUTICS					
INFRASTRUCTURE					
HEALTH					
BIOMEDICAL					
BIO-INFORMATICS					
HEALTHCARE MANAGEMENT					
MATERIALS PROCESSING					
PREPARATION					
CHARACTERISATION					
FORMING					
NANO-TECHNOLOGIES					
INDUSTRIAL PROCESSES					
COMPUTER SCIENCE					
SOFTWARE ENGINEERING					
INNOVATION					
INNOVATIVE DESIGN METHOD					
BUSINESS ORGANISATION					
SOCIOLOGY					

Maturation, technology transfer and start-ups



Transforming research results into innovation: Transvalor's mission

Reinforcing the socio-economic impact of research

ARMINES is the reference shareholder of its subsidiary TRANSVALOR SA which is responsible for converting the research results into innovation. "Maturation" is the intermediate stage between research and the market.

TRANSVALOR SA fulfils this role either internally or externally by participating in spin-offs based on the technologies of the research centres, predominantly in the field of technical software.

In 2013 TRANSVALOR SA (47 employees) had a turnover of €6.2 million, which mostly came from the industrialisation and commercialisation of scientific simulation software for material forming (simulation of forging and casting processes in particular) produced by CEMEF (ARMINES - MINES ParisTech common research centre) in Sophia Antipolis. In recent years, this branch of the organisation has seen profitable internal growth thanks to its international success (66% export).

Delivering results more applicable to Industry

From 2009 on, moreover, TRANSVALOR SA decided to strengthen the development of new activities originating from the common research centres by setting up an Innovation Department responsible for the maturation of the projects.

This internal activity at TRANSVALOR SA functions as a virtuous circle which has the effect of reinforcing the application of the results by industry and in so doing galvanises the research itself and its socio-economic impact.

Standing out amongst these at the common research centres with MINES ParisTech are:

- Industrialisation of the **SODA** web services portal and the **HELIOCLIM** solar radiation database developed at the O.I.E Centre
- Fluid transfer simulation in porous environments taking geochemical exchanges into account (**CHESS** and **HYTECH** software developed at the Centre for Géosciences)
- Commercialisation of the **MORPH-M** image analysis software at the Centre for Mathematical Morphology.

TRANSVALOR SA provides user interfaces and technical support for each of these software developments.

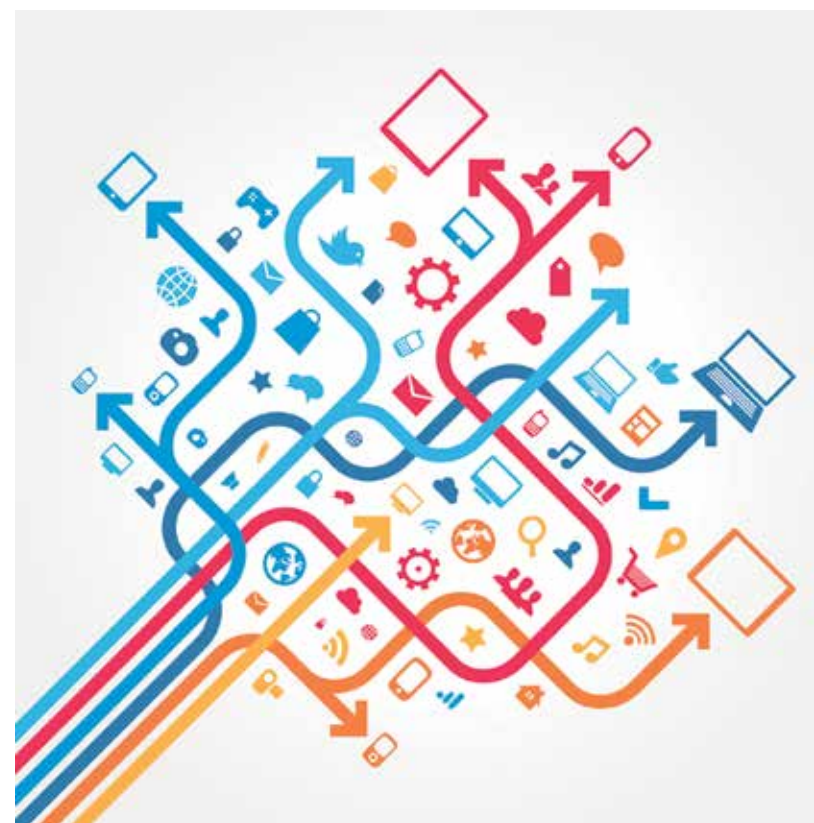
Supporting the research centres spin-offs

TRANSVALOR SA uses a proportion of its own capital to provide seed capital in the first financing round. TRANSVALOR SA advises businesses set up on the basis of technologies which emerge from the centres. It is a shareholder in the following companies:

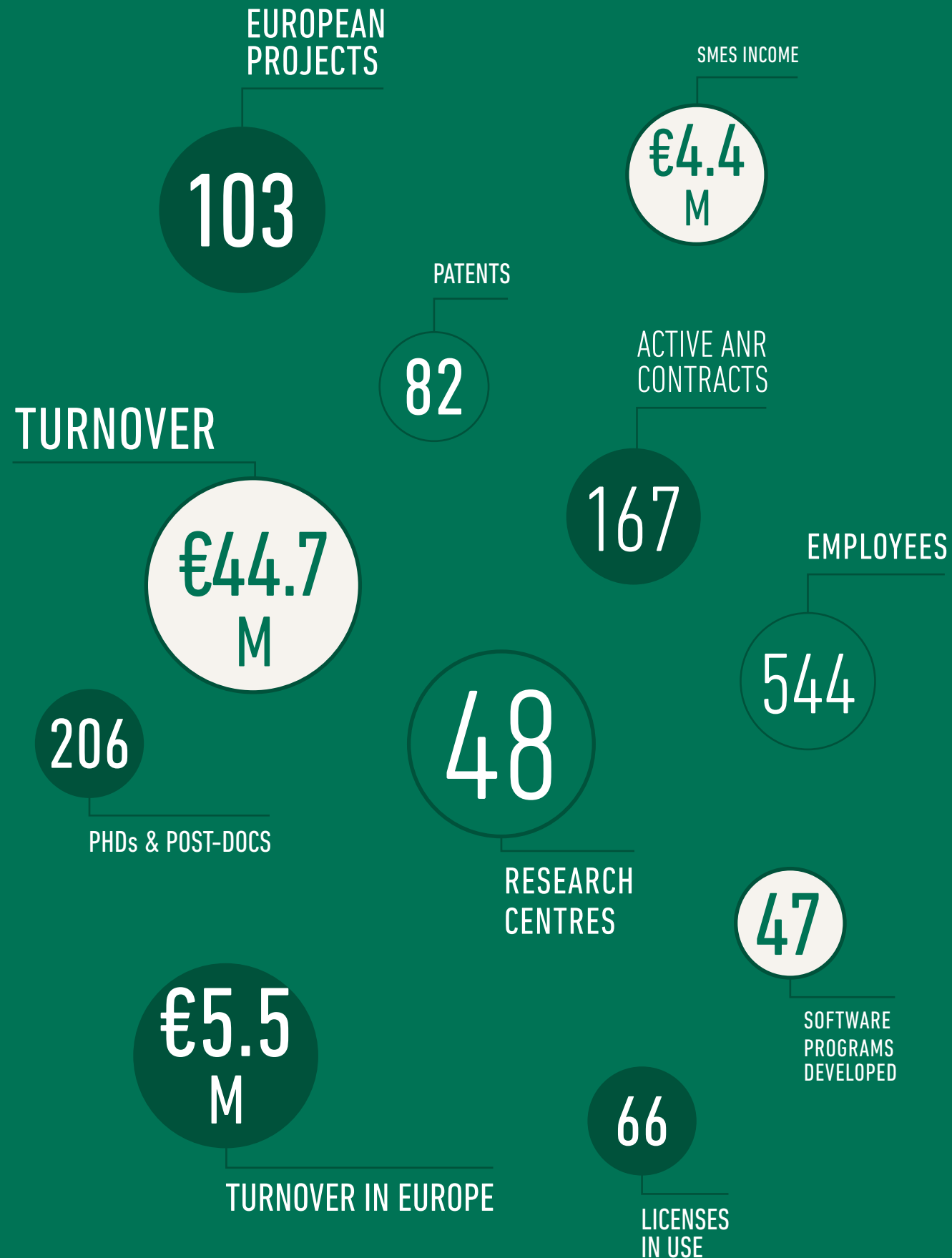
- GÉOVARIANCES (geostatistics, MINES ParisTech)
- MICROECONOMIX (econometrics of competition, MINES ParisTech)
- AI4R (medical imaging, Mines Nantes)
- EAYSVIRT (data centre energy optimisation, Mines Nantes)
- TRANSVALOR Americas, distribution subsidiary in the USA.

→ www.transvalor.com

In 2013, with six other private research commercialisation organisations linked to engineering schools and universities (INPG Entreprise SA, Centrale Innovation, ADERA, ARTS, ADRINOR, INSAVALOR), TRANSVALOR created the investment company PERTINENCE INVEST to pool support for establishing start-ups based on the technology of their schools' and partner universities' laboratories. Five projects have been given backing over a 18-month period.



In partnership with the Sigma Informatique company and the Green Lab Center association, the *École des mines* in Nantes is interested in Cloud management and has created the TUBA (automatic loop user test) prototype in order to adapt directly to user demand while complying with the service levels expected and the ecological and economic constraints.



FINANCIAL RESULTS FOR 2013

After several years of growth up until 2010, turnover decreased slightly in 2011 by around 2% and stabilised in 2012. Because of the economic crisis, activity decreased in 2013 by around 5% but it was a balanced financial year nevertheless.

With total turnover of more than €44.7 m and a surplus of €123 K, ARMINES has held on to the top spot amongst the private contract research institutions affiliated to higher education establishments at national level.

Collaborative research carried out using public funding, particularly as part of invitations to tender by the French National Research Agency (ANR) and innovation clusters, stands at €11.2 m, or 25% of total income.

Total contracts signed directly with the private sector without public funding still counts for the majority, representing 56% of the total (€25.2 m).

2013 was also notable for the end of the FP7 (European framework programme for technological and research development) with turnover worth €5.5 m or 12% of total contracts. 14 new European contracts as either co-ordinator or partner were recorded in 2013.

The "resourcing science" initiatives associated with the Carnot label awarded to the *Institut Carnot M.I.N.E.S* have remained stable and represent 6% of the total (€2.8 m).

Lastly, ARMINES currently hosts 3 ERC (European Research Council) grants: one with the *École des mines* in Saint-Étienne and two with MINES ParisTech.

Our aim in future years is to increase the share of direct industrial contracts and reinforce our mission to contribute to economic development by pursuing the expansion of our industrial partner network to innovative medium-sized and small businesses.

2013 FIGURES

COMPARATIVE TURNOVER

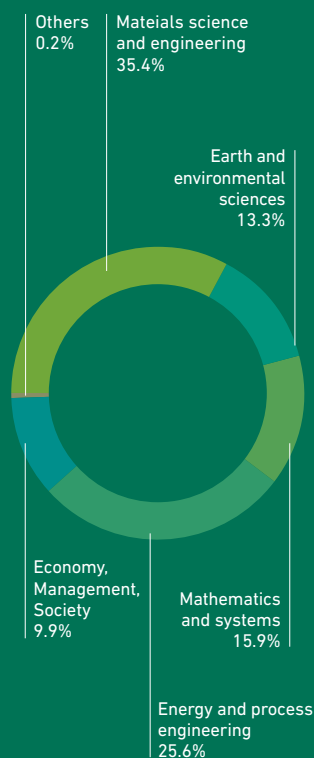
2011: €47.2 M
2012: €47.17 M
2013: €44.68 M

TOTAL TURNOVER PER PARTNER SCHOOL IN 2013

Partner School	Turnover (€ M)	Percentage (%)
MINES ParisTech	€27.8 M	62.0%
Mines in Saint-Étienne	€2.9 M	6.4%
Mines in Douai	€4.5 M	10.0%
Mines in Alès	€2.1 M	4.7%
Mines in Nantes	€3.5 M	7.8%
Mines in Albi-Carmaux	€2.5 M	5.5%
Polytechnique ParisTech	€0.5 M	1.1%
ENSTA ParisTech ⁽¹⁾	€0.2 M	0.4%
Navale	€0.1 M	0.1%
ENPC ParisTech ⁽²⁾	€0.1 M	0.2%
Miscellaneous ⁽³⁾	€0.8 M	1.7%

(1) ENSTA ParisTech - (2) École des Ponts ParisTech - (3) including management resources of European consortia

TURNOVER AT ARMINES / MINES PARISTECH JOINT CENTRES IN 2013



Materials Sciences and Engineering

Materials Centre	€5.7 M
Material Forming Centre	€4.0 M
Solid Mechanics Laboratory	€0.2 M

Earth and Environmental Sciences

Centre for geosciences	€3.7 M
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Mathematics and Systems

Centre for Applied Mathematics*	€0.8 M
Centre for Automotion and Systems	€0.4 M
Centre for Computer Science Research	€0.2 M
Centre for Robotics	€1.7 M
Centre for Mathematical Morphology	€1.0 M
Centre for Bio-informatics	€0.5 M

Energy and Process Engineering

Centre for System Energy Efficiency (CES)	€3.5 M
Centre for Thermodynamic Process (CTP)	€0.6 M
Centre for Observation, Effects, Energy (O.I.E)	€0.9 M
Centre for Process, Sustainable Energies Energy Systems (PERSEE)	€1.9 M

Economics, Management, Society

CERNA Centre for Industrial Economics	€0.4 M
Centre for Sience Management	€1.2 M
Centre for Innovation Sociology	€0.5 M
Centre for Risk and Crisis Research	€0.8 M

Others	€0.1 M
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● Évry ● Fontainebleau ● Palaiseau ● Paris ● Sophia Antipolis

BREAKDOWN OF EXPENDITURE 2013



NUMBER OF CONTRACTS REGISTERED BY FUNDERS IN 2013 (EXCLUDING CARNOT CONTRIBUTION)

EU contracts: 14
French government, ANR: 167
French government agencies, EPICs: 135
Businesses: 510
Total: 826

DISTRIBUTION BY SIZE OF CONTRACT IN 2013

<€10K	2.3%
€20K	8.5%
€40K	18.4%
€75K	32.4%
€150K	54.3%
€300K	86.0%
€500K	97.3%
>€500K	100%

STAFF BY SITE

Site	2011	2012	2013
Paris	89	81	94
Sophia Antipolis	76	86	72
Douai	68	65	67
Fontainebleau	69	64	64
Évry	62	64	67
Nantes	45	41	42
Alès	35	38	30
Albi	29	35	35
Saint-Étienne	40	31	35
Marne-la-Vallée	2	2	1
Pau	2	3	3
Palaiseau	40	37	34
Brest	-	-	-
Total	557	547	544

STAFF AS OF 31/12/2013

Central management	48	8.8%
Researchers and engineers*	341	62.7%
Research technicians	90	16.5%
Research administrative staff	65	12.0%
Total staff	544	100.0%
including, Permanent	285	52.3%
RTC**	122	22.3%
Temporary contracts	139	25.4%

* Including PhD students and post-doctoral fellows

** RTC: PhD students with research training contracts

ARMINES, NETWORK PARTNER

AICarnot: The Association of Carnot Institutes

ARMINES is the body which represents the *Institut Carnot M.I.N.E.S (6 Écoles des mines* under the responsibility of the French Ministry of Productive Recovery and ARMINES) within AICcarnot (The Institut Carnot association) and has a seat on the Board of Directors.
→ www.instituts-carnot.eu

EARTO

ARMINES is one of the 350 members of the European Association of Research and Technology organisations.
→ www.earto.eu

C.U.R.I.E. network

ARMINES is a member of the network which brings together stakeholders involved in the exploitation of French public research.
→ www.curie.asso.fr

ARMINES is also a member of ANRT, EIRMA (European Industrial Research Association Management) and ASRC.

www.armines.net



More than a hundred reports or evidence-based videos presenting collaborative research



- Web TV and special reports
- Research expertise
- Access to research centres
- News

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Deputy Scientific Director for Energy, Sustainable Development, Chemicals and Processes sector – Directorate General for Research and Innovation – French Ministry of National and Higher Education and Research

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SAP Europe, Middle-East and Africa,
Head of EMEA Services Industries

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François Mudry
Chief Executive of IRT M2P

French Government Commissioner

Emmanuel Caquot
Chief Mission Supervisor to schools, General Council of Economy, Industry, Energy and Technology - French Ministry of Economy and Finance

Statutory Auditors
GBA Audit et Finance

The Management Team



Pascal Iris
Director



Philippe Le Bozec
Deputy Director



Patricia Renaud
Deputy Director



Valérie Tainturier
Human Relations Director



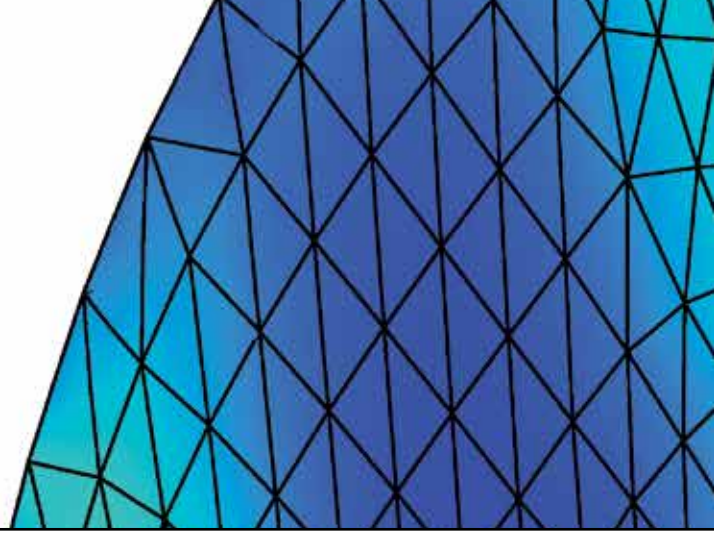
Pascal Hermann
Accounting and Finance
Director



Emmanuelle Lafouge-Gérardin
Head of Management Audit



Véronique Chapuis
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ARMINES

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A list of our research centers is available
on-line at: www.armines.net

Since January 2010 research activities carried out by ARMINES and the *Écoles des mines* in their common research centres has been eligible for research tax credit under the same conditions as French government-funded laboratories (article 244 quater B II of the General Tax Code).



Front cover: Digital simulation of crack propagation in front of automobile motor cylinder fire. This calculation was done with Z-set software (www.zset-software.com) developed at the Centre for Materials MINES ParisTech / ARMINES. The calculation allows to predict the location of crack initiation, their propagation path and their eventual end.

Photographs: Agence Contextes / IC M.I.N.E.S., taken in the ARMINES - *Écoles des mines* common research centres; Fotolia, J. Eichinger, Falcon664, Hammerq, M.Oleksiy, Shutterbas, B. Wylezich.

Graphic design and production: Contours, Paris