

2011
annual report

41
calls for proposals,
(of which 14 are open to international collaborations)

6,319
project applications

1,296
projects funded

21.3%
Average application success rate

Average funding per project:

€350 k
for "open" calls for proposals

€700 k
for public-private partnership calls for proposals

8.6%
allocated to private enterprises research

20.1%
allocated to universities

16,000
peer reviews
(including Investments for the Future)

2,200
members of Evaluation Panels
(including Investments for the Future)

500
members of Steering Committees

200
members of Strategy and Planning Boards

35%
foreign external reviewers

67,338
man/months of Ph.D
and post-doctoral researchers funded

50
symposia in Paris and the French regions



ANR IN FIGURES

**CALL FOR PROPOSALS
PROGRAMME PLANNING
BUDGET:
€557 M**

**Including €57.7 M
devoted to transnational projects
(i.e. 10% of the budget)**

EDITORIAL //



The year 2011 saw a strong increase in the activity of the ANR, with the selection and setting up of projects funded in the framework of the Investments for the Future. This government initiative considerably changes the scope of action of the ANR for the next decade. Today the ANR is the accountant of what best projects selected portray of French science. This capital must be analysed and communicated to the community of researchers.

The various calls of Investments for the Future have reinforced the structuring of certain scientific communities around broad themes embodying major issues or research infrastructures.

The intensity and richness of actions involved in setting up the Investments for the Future have enabled the ANR to underpin its legitimacy in a high-quality selection process, to “unleash” researchers’ creativity by responding to their expectations and giving research and higher education institutions and hubs the means to establish true strategies and agreed research policies. What ANR has done with the Investments for the Future is exactly what it has been doing since 2005, namely supporting collaborative research projects by stimulating and highlighting the value of scientific excellence, by creating gateways that go beyond the establishments, that create original partnership ties, promising scientific and technological leaps and growth. To achieve this, ANR moulds its action to a determined and ambitious research funding policy, in relation with an evolving research landscape.

It is necessary to fit into this landscape in order to respond to major societal issues, such as health and energy. These issues can only be addressed in a coordinated manner not only at national level but also with our foreign counterparts. This is also the contribution that ANR can make to science and the citizens, because it represents a true international opening.

The ANR offers a variety of programmes ranging from research at the frontiers of knowledge to research on more application-driven topics, and it encourages participation of private companies.

Budgetary constraints have prevented some programmes from being launched as widely as the ANR would have liked. This factor - linked to the global economic context - has nevertheless not demotivated the research teams, who this year have yet again submitted excellent research proposals. The increasingly remarkable quality of the projects makes selection very difficult. The scientific world, and society at large, are eagerly awaiting results from research that will bring new developments. It must nevertheless be borne in mind that these highly operational results, which are applicable in the every-day life of the population, are necessarily the fruit of the meeting between “academic” and industrial researchers, and only emerge in a context that is also favourable to bottom-up fundamental research.

The ANR has a role in the research arena extending beyond national borders by developing structuring collaborations in Europe and offering scientists the opportunities to carry out transnational projects and team up with top-level international researchers. The ANR and its teams have risen to the challenges that have been thrown its way, to contribute to the construction of the scientific Europe of tomorrow, by providing strong support to young researchers. The Young Researchers Programme can indeed be considered as a stepping stone for young French researchers applying to the ERC (European Research Council) starting grants programme.

Complementing other modes of research funding, the ANR has - since its creation - demonstrated its legitimacy and capacity to evolve.

Eva Pebay-Peyroula
Chairwoman of the Governing Board

SUMMARY //



03

ABOUT THE FRENCH NATIONAL RESEARCH AGENCY

14

INVESTMENTS FOR THE FUTURE

18

DEVELOPING EUROPEAN & INTERNATIONAL COOPERATION

29

FOSTERING THE EMERGENCE OF NEW KNOWLEDGE
& THE PRODUCTION OF INNOVATIVE CONCEPTS

37

FUNDING RESEARCH RESPONDING TO SOCIETAL CHALLENGES

44

SUPPORTING RESEARCH ENDEAVOURS RESPONDING
TO ECONOMIC & COMPETITIVENESS CHALLENGES

50

ENCOURAGING RESEARCH ADDRESSING ENVIRONMENTAL
ISSUES & GREEN TECHNOLOGIES

57

INTENSIFYING PARTNERSHIPS BETWEEN ACADEMIA & INDUSTRY

61

DISSEMINATING KNOWLEDGE

69

APPENDICES

// ABOUT THE FRENCH NATIONAL RESEARCH AGENCY

The French National Research Agency (ANR) is a research funding organisation established by the French government in 2005 to fund research projects, based on competitive schemes giving researchers the best opportunities to realise their projects, and paving the way for ground-breaking new knowledge. The role of the Agency is to bring more flexibility to the French research system, foster new dynamics and devise cutting-edge strategies for acquiring new knowledge. By supporting priority research areas and fostering public-private collaborations, the ANR also aims at enhancing the general level of competitiveness of both the French research system and the French economy.

Project-based research funding is well established in many countries where it is known to stimulate research organisations and strengthen their synergies. The ANR's approach to funding allows French research to reinforce its international position and better integrate the framework of European cooperation.

The role of the ANR is essentially to act as a catalyst and amplifier of the research themes that emerge within the various scientific communities, whether universities, research organisations, alliances or, in certain cases, companies, depending on their strategy and inventiveness. The programme planning it proposes to research teams meets current scientific, technological, economic, environmental and societal priorities, while leaving extensive freedom to propose innovative projects, with 50% of its budget being allocated to investigator-driven "bottom-up" programmes.

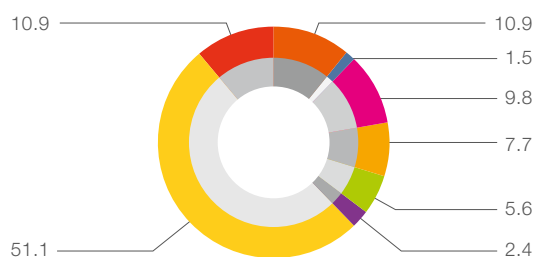
ANR funds are available in all scientific fields, for both fundamental and industrial research and for public research organisations as well as private companies (through public-private partnerships). With a peer review process matching the highest international standards, ANR's general goal is to fund excellent research, while also facilitating innovation and interdisciplinary work and developing European and international collaborations.



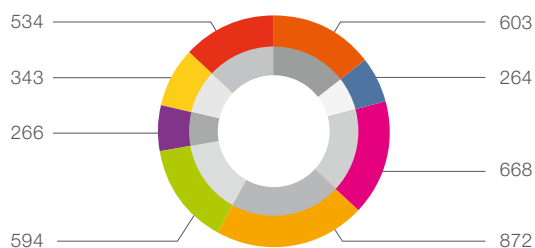
✓ **FUNDING ALLOCATION BY TYPE OF BENEFICIARY**

Research performing organisations	49.7
Universities	20.1
Other higher education institutions	7.3
Hospitals	1
Other research institutions	8
Foundations	2.8
Associations	0.9
Very small enterprises	1.6
SMEs	2.9
Other enterprises	4.1
Miscellaneous private	1.5

✓ **FUNDING ALLOCATION BY SCIENTIFIC DEPARTMENT (%)**

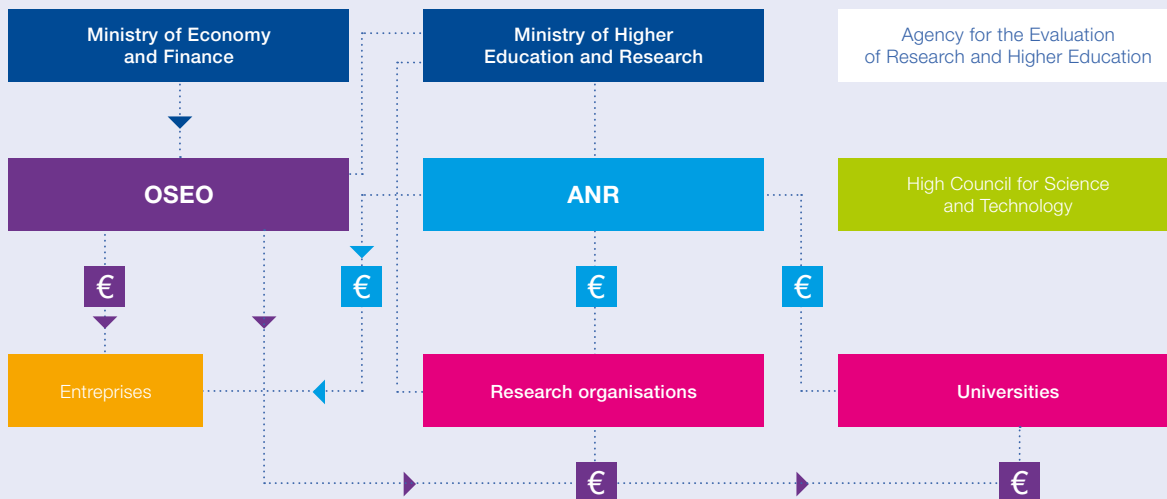


✓ **AVERAGE FUNDING PER PROJECT BY SCIENTIFIC DEPARTMENT (€k)**



- Engineering, Processes and Security
- Social Sciences and Humanities
- Information and Communication Sciences and Technologies
- Sustainable Energy
- Environment and Biological Resources
- Partnerships and Competitiveness
- Bottom-up programmes
- Biology & Health

✓ ANR IN THE FRENCH RESEARCH SYSTEM



▲ As a research funding agency, the ANR's goal is to define programmes on priority areas corresponding to national strategic orientations.



// ORGANISATION & STAFF

The ANR is located in Paris, with its headquarters in the Gare de Lyon area and another site in the New National Library district.

The Agency is headed by a Director General. It is organised around 8 scientific departments, each with a Head of Department and a number of Programme Directors and Project Managers.

The ANR is staffed by 266 people, nearly half of whom are scientists. The typical Programme Director supervising each ANR programme is an active senior scientist often working part time at the ANR for a set period before returning to his or her institution or moving to another one.

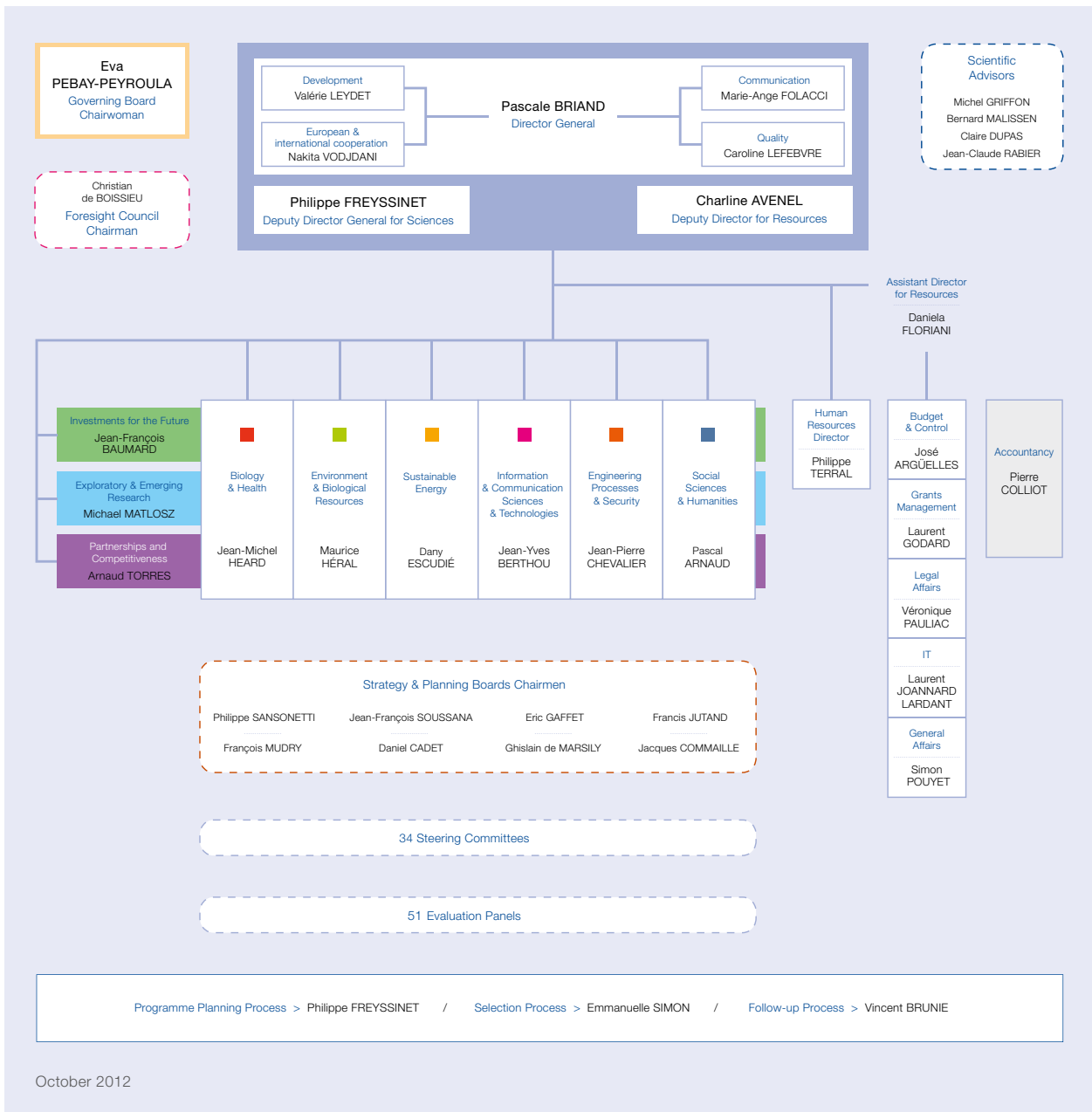
◀ © Mathieu Cozanet - ANR 2009

✓ ORGANISATION CHART

6 departments are dedicated to broad scientific areas and priorities. The other two are dedicated to running the agency's bottom-up schemes and fostering public-private partnerships.

The European and International office works with all the scientific departments. Administrative services are grouped under the General Secretary to handle all general affairs, legal matters and finance and awards management.

It is worth noting that administrative costs are maintained at a very low level at the ANR, and represented just 3.4% of the agency's funding budget in 2011.





✓ GOVERNING BOARD

Taking all major decisions, the role of the Governing Board is to define the general frame of agency's operations. It is responsible for questions relating to science and research policy, discussing the financial planning for the coming years and adopting the annual budget.

The Board has 12 members and is made up of:

- The chairman of the French High Council of Science & Technology

6 State representatives:

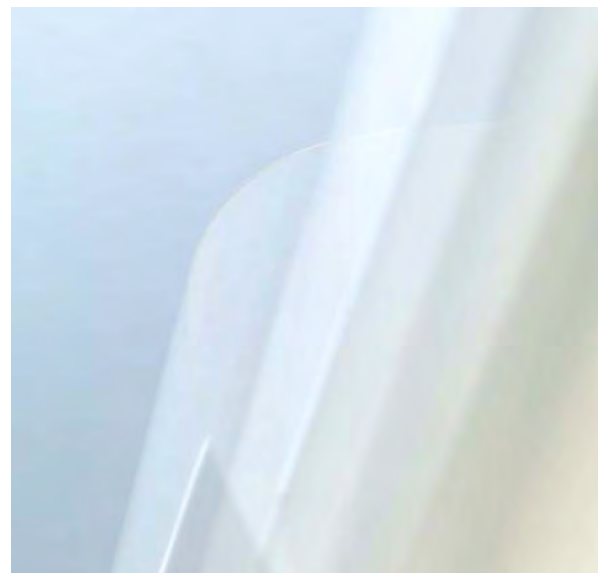
- 3 from the Ministry of Higher education and research
- 1 from the Ministry of Budget
- 1 from the Ministry of Economy and Finance
- 1 from the Ministry of Ecology, sustainable development and energy

- 5 highly qualified scientific personalities.

Although no set quota exists for the distribution of seats, efforts are made to split the seats equitably between scientific and academic fields. The Chair is chosen from among the 5 scientific personalities.

// SCHEMES & PROGRAMME TYPES

The ANR's core activity is to issue calls for proposals through Programmes. In 2011, 41 calls for proposals were published in all scientific areas. A programme may consist of a number of calls for proposals, issued within the same year or over a longer period. Typically, a programme will issue one call per year during three years and span a total of up to eight years, as the projects themselves can last two to four years.



✓ **ANR SCHEMES AND PROGRAMMES CAN BE DIVIDED ALONG TWO LINES:**

“Top-down targeted programmes” and investigator-driven “bottom-up programmes”,

“Open” programmes and “Public/Private Partnerships” programmes.

• **Targeted programmes** are the result of a top-down definition process. Responding to economic, environmental and societal demands as well as areas of scientific or technological priority, they accounted for 50% of the agency's grants in 2011.

ANR's programmes are organised in 6 broad areas:

- Environment and Biological Resources;
- Engineering, Processes and Security;
- Health and Biology;
- Information and Communication Sciences and Technologies;
- Sustainable Energy;
- Social Sciences and Humanities.

• **Bottom-up programmes** cater for researchers' creativity through a clear bottom-up process. They account for the other 50% of the agency's grants.

• **Public-private partnerships programmes** require at least one partner from each sector, public and private.

✓ **TRANSPARENCY, EQUITY, EFFICIENCY**

In 2008, ANR obtained the **ISO 9001** certification by AFNOR for its entire selection process. Since 2010, all of ANR's 3 processes have been ISO 9001 certified. This certification reflects the concerted efforts of the Agency's staff to develop rigorous and optimised working methods.



✓ **USERS' COMMITTEE**

In order to adopt a continuous improvement-driven approach for its actions, and optimally meet the expectations of its beneficiaries, the ANR has set up a “Users' committee” responsible for responding to the perception of the processes, their effectiveness, and reporting on the difficulties encountered in the various stages of a project cycle, from submittal through to closure. The committee can give its opinion on both scientific and administrative aspects.

✓ **INITIATIVES CARRIED OUT BY THE ANR ARE ORGANISED INTO THREE PROCESSES:**

Programme Planning

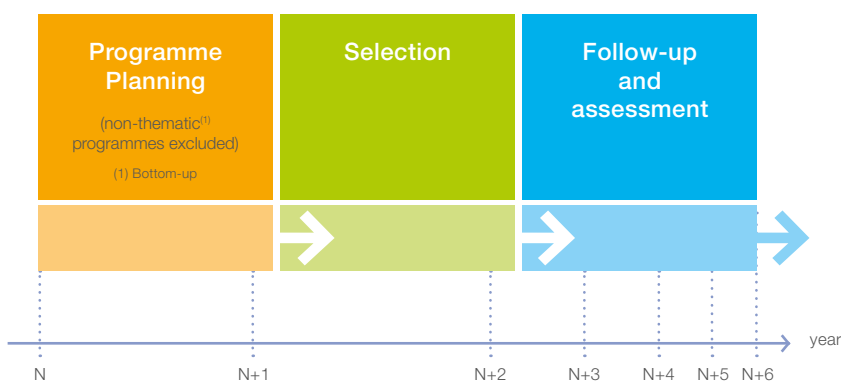
defining the outline of programmes and the content of the calls for proposals each year

Selection

of projects to be funded through peer evaluation in accordance with international standards

Follow-up and assessment

of funded projects; programme assessment and dissemination of results when projects have ended.



// CONSTANTLY ATTENTIVE TO THE SCIENTIFIC COMMUNITY

ANR PROGRAMME PLANNING AND FORESIGHT STUDIES

The ANR programme planning is an important component of the National Research and Innovation Strategy (SNRI). It aims to act as a catalyst and amplifier for research themes that emerge within different components of society (public authorities, scientific communities, industry). Programming is a highly iterative process that is based on a broad consultation of the national scientific community into the future research needs, in both fundamental and finalised research. The ANR's goal is to design programmes on priority areas corresponding to national strategic orientations. They respond not only to societal, environmental and economic needs, but also to technological and scientific challenges.

Multidisciplinary remains a priority in the ANR's thematic programming approaches.

Multidisciplinary is crucial to pave the way for innovative scientific approaches adapted to societal and global challenges. Some issues, owing to their nature, their causes or their impact, involve several different sectors and can only be resolved through an interdisciplinary approach. One of the goals of the ANR is to encourage dialogue and avoid "silo effects" between disciplines, and to foster research responding to cross-discipline and often cross-border issues by implementing programmes that bring together teams from different sectors. These programmes call for cross-disciplinary research efforts in various fields such as sustainable cities, global changes or contaminants and health, etc.

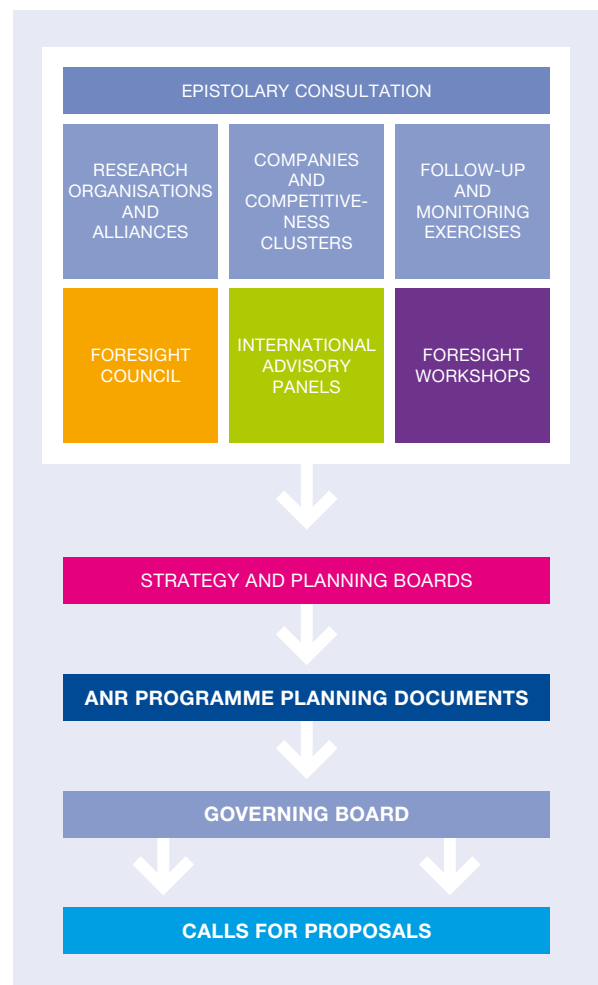
More generally, the programme planning is inspired by the need to ensure that the economy and society come out of the current crisis positively changed in order to anticipate the necessary adaptations.

2011 is an interim year in terms of thematic programming. The orientations to a very large extent take up the content proposed in 2010 for the triennial cycle from 2011-2013 and the majority of the thematic programmes are continued. The work focused particularly on the visibility and dissemination of the programme planning document, which was downloaded more than 80,000 times in 2011. An abridged version of the document was also proposed in English.

www.agence-nationale-recherche.fr/Programme-Planning-2011-2013



In order to enrich its portfolio of top-down programmes with the most strategic considerations, the ANR implements a continuous foresight and programme planning process in which it consults the widest possible range of national and international stakeholders.



▲ The annual programme planning process is the result of multiple inputs, including feedback from the previous or on-going programme follow-up and assessment process.

✓ ANR STRATEGY AND PLANNING BOARDS

The programme planning is developed essentially from the work of the eight Strategy and Planning Boards made up of 200 scientists and representatives from industry, the public authorities and the five research alliances.

2011 Strategy and Planning Boards:

- **Social sciences and the humanities**
Chairman: Jacques Commaille, Emeritus Professor, École Normale Supérieure de Cachan
- **Biology and Health**
Chairman: Philippe Sansonetti, Professor, Collège de France
- **Earth System Sciences**
Chairman: Ghislain de Marsily, Emeritus Professor, member of the Academy of Sciences, member of the Academy of Technologies, University Paris VI and Ecole des Mines de Paris
- **Ecosystems and Sustainable Development**
Chairman: Jean-François Soussana, Environment Scientific Director, INRA
- **Information and Communication Sciences and Technologies**
Chairman: Francis Jutand, Scientific Director of the Telecom Institute, Vice-chairman of the Cap Digital centre
- **Nanotechnologies**
Chairman: Eric Gaffet, CNRS Research Director, Nanomaterials Research Group, Belfort
- **Chemistry, Materials, Processes**
Chairman: François Mudry, Scientific Director, ARCELOR-MITTAL
- **Sustainable Energy**
Chairman: Daniel Cadet, Director of External Relations, Alstom Transport, Engineering Department

These boards play a key role in defining ANR programme planning through reflection on new programmes, permanent guidance on calls for proposals, or decisions to terminate programmes. Their reflection is enriched by considering all proposals on new programmes stemming from research stakeholders through a consultation by letter, as well as advice from the ANR Foresight Council, existing foresight studies, assessments of previous calls, information on the international research scene and the results of Foresight Workshops. The Strategy and Planning Boards are invaluable as crossroads for discussion on strategies, in particular between public and private sector research.

ANR FORESIGHT COUNCIL

The ANR Foresight Council was created in February 2008 and consists of a restricted number of members from a range of sectors with experience in foresight and planning. The council's objective is to provide a continuous set of guidelines for strategic positioning on the international research and development scene. The council listens to expert testimonies and examines future prospective reports submitted by ANR Strategy and Planning Boards as well as by the Foresight Workshops. The opinions produced by the Foresight Council help determine the content of ANR programmes over the long term. The Foresight Council meets tri-annually.

Members:

Philippe Aghion, Thierry Chambolle, Jean Marc Egly, Thierry Gaudin, Jean-Claude Lehmann, Jean-François Minster, Pierre Veltz, Jean Weissenbach.

ARP FORESIGHT WORKSHOPS

The ANR Foresight Workshops (ARP) are intended to encourage collective and prospective analyses on emerging themes with strong societal and scientific implications. These workshops unite researchers and decision makers from the public, private and associative sectors and serve to identify new research questions, thereby contributing to ANR programme planning in areas as yet relatively unstructured.

Four ARPs were ended in 2011:

Two ARPs concerned the Mediterranean region. The first, PARME, focused on the areas of research and innovation requiring, by the year 2030, cooperation between the Mediterranean basin countries. The second, FUTOUROMED, identified the research needs for the development of tourism in the Mediterranean combining culture and technologies.

The "What innovations, what disruptions in society and the digital economy" ARP identified and analysed a diversity of possible changes and disruptions for the society and digital economy by the year 2030.

The ARP "The learning of tomorrow: know-how and tools" sought to identify and detail the major issues relative to knowledge and tools for learning and teaching between now and the year 2030, in their social, economic and industrial dimensions.

// SELECTING & FUNDING THE BEST RESEARCH PROJECTS

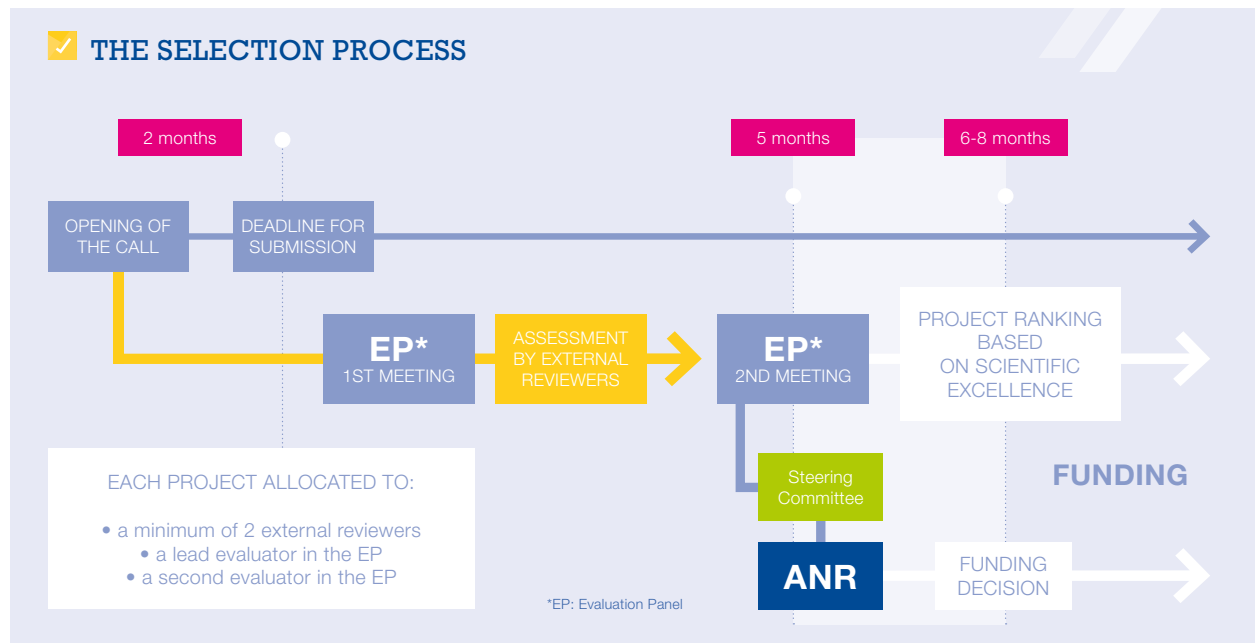
A SELECTION PROCESS BASED ON PEER REVIEW AND INTERNATIONAL STANDARDS

The keywords here are transparency, equity and quality. ANR processes are based on competitive schemes and a two-stage peer review process which received ISO 9001 certification in 2008. The central element of the review process is the evaluation panel. For every call for proposals, ANR nominates a specific panel.

In the first stage, a minimum of two written reviews are obtained from external expert reviewers who are appointed by the panel members. In the second stage, the projects are assessed by the panel, which consists of internationally recognised researchers from the public or private sector, with the highest knowledge of the scientific and technological issues addressed in the programme.

The panel assesses all eligible applications and ranks them in three categories (A: recommended for funding; B: acceptable; C: not recommended for funding). It recommends a short-list of the most promising applications to the programme Steering Committee, which comprises qualified prominent figures and institutional representatives and which then proposes a final list of recommended applications to the ANR.

All the persons involved in project selection undertake to comply with the provisions of the ANR's code of ethics and in particular the rules pertaining to the confidentiality and conflict of interest.



THE EVALUATORS IN FIGURES

- 16,000 external reviews
- 35% of foreign external reviewers
- 2,200 members of evaluation panels

FUNDING

In most ANR schemes, projects can last 2 to 4 years and the Agency funds either marginal costs or Full Economic Costs (FEC), according to the status of the applicants.

The ANR generally funds marginal costs for public academic institutions, thus covering all expenses necessary for the projects: equipment, travel costs, outsourcing, contracted personnel costs (ANR grants can be used to fund post-doctoral positions as well as PhD students in most scientific fields. The salaries of researchers or participants with tenured positions are paid directly and independently by their own institutions and are not included in ANR budgets.)

For private sector applicants, ANR funds in 'Full Economic Cost' mode. Funds are available to both SMEs and larger companies. The ratio of funding is subject to the applicable rules of the European Union regulations on free competition and State aids.

// ACCOMPANYING THE PROJECTS DURING THEIR LIFETIME & ASSESSING THE RESULTS OF THE SCIENTIFIC PROGRAMMES

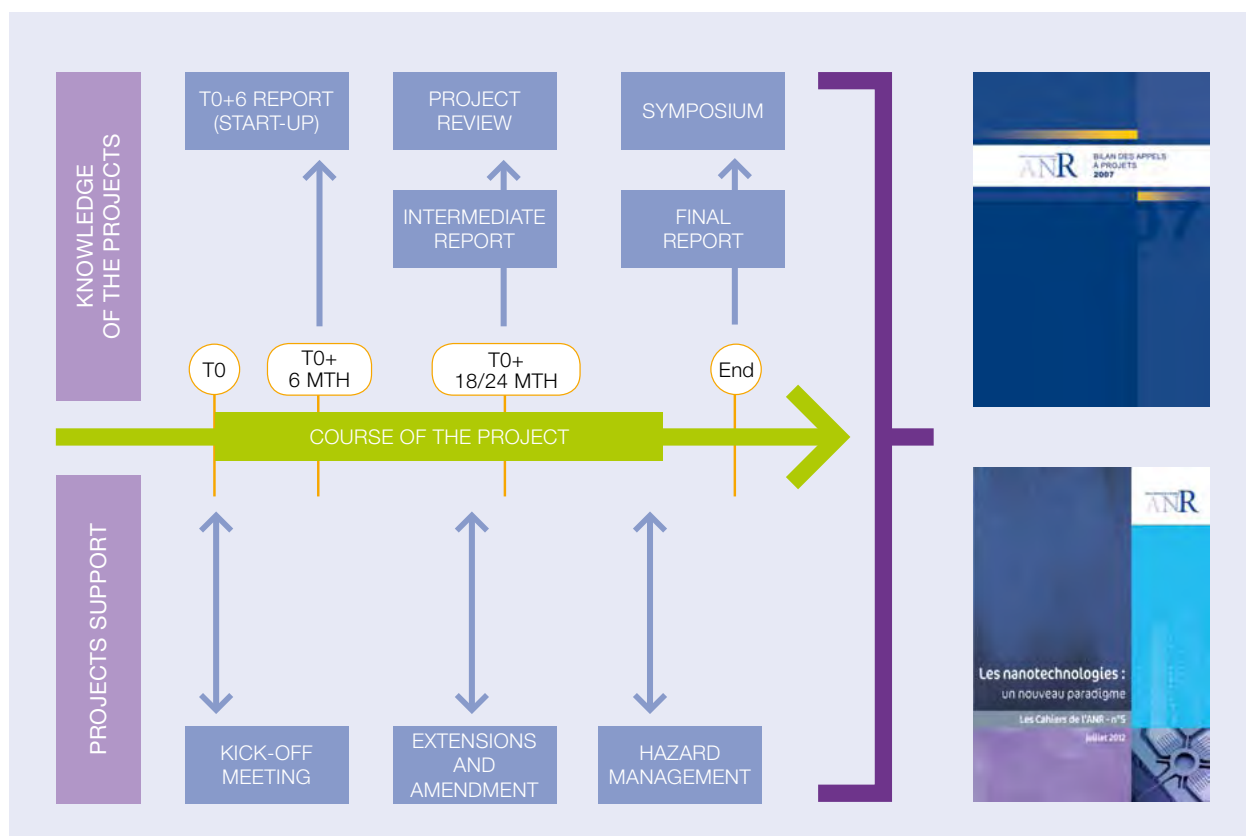
THE FOLLOW-UP AND ASSESSMENT PROCESS

✓ THE THIRD PILLAR OF THE ANR'S ACTIVITY IS THE FOLLOW-UP AND ASSESSMENT PROCESS

These activities serve to monitor the progress of the funded projects and verify that they actually meet their initial commitment, and to provide appropriate answers to the scientific teams if they encounter difficulties during the project lifetime. All funded projects are therefore carefully monitored during their realisation through diverse procedures such as intermediate and final reporting, individual review seminars and collective symposia.

Two intermediate reports are provided for each project. The first report is required at T0+6 months, and its purpose is to detect any difficulties in engaging the means necessary for project start-up. The second intermediate report is required at mid-project in the form of an executive summary for comparing project progress with the planned milestones for the results, budget and deadlines. This intermediate report is synchronised with a project review that enables ANR, assisted by external experts, firstly to establish a clear idea of the scientific and technical progress of each project, and secondly to detect any functional difficulties.

When individual projects end, the calls for proposals and programmes themselves are evaluated in the light of their initial objectives. The effective final results of each project are assessed through the end-of-project report, which takes stock of the scientific, financial and organisational situation. This document also provides the opportunity to set forth the initial impacts of the project, chiefly in terms of scientific publications and intellectual property rights.



Programme dissemination and results

The ANR also plays a role in disseminating the project results by publishing project summaries updated by their principal investigators as they progress, and by organising symposia associated with the different programmes, enabling projects that have reached or are nearing completion to disseminate their results to the community concerned by each programme. These symposia, which are often organised in collaboration with learned societies, or competitiveness clusters, etc., also provide an occasion to collectively make an initial assessment of the programmes and conduct a forward-looking reflection on the basis of the project results.

The ANR draws up formal assessments of its programmes on the basis of the final reports and the symposia, which enables it to capitalise on all the significant elements of a programme in a single document. This information is used extensively in the programme planning process, and in the ministries. In order for it to be available as early as possible for decision making, the assessment document is drawn up and enriched incrementally from programme launch through to the end of the last project of the last edition of the programme. Summary versions of these assessments, focusing chiefly on the most significant results, are disseminated annually on the ANR's web site for each programme.



Managing the contingencies encountered by the projects is also an important activity.

When the ANR is obliged to take decisions on projects that meet with difficulties, it always endeavours to maintain the initial project objectives. The examination of the decisions having an impact on the future of the project or the possibilities of achieving the objectives is mutualised within the ANR.

It is also important to point out that all the monitoring and assessment activities are founded on a number of basic principles that aim to limit the effort demanded of the project principal investigators and to ensure high-quality relations between them and the ANR. These principles include establishing a relationship of confidence between the ANR and the principal investigators of the projects it finances, ensuring uniformity of practices between the programmes, and good linking between the scientific and administrative spheres.

International Advisory Panels

Established in 2008, the International Advisory Panels consist of prominent international scientific figures, with a majority of Europeans among their members. Each Panel, working in its specific field of competence, delivers a biennial report on the adequacy of ANR programmes and procedures and produces recommendations for future orientations. Standing at the crossroads of the programme planning and assessment processes, the international advisory panels' reports constitute one of several inputs leading to the ANR annual programmes plan.

// INVESTMENTS FOR THE FUTURE

As part of a government initiative to reinforce long-term French competitiveness, a major programme called “Investissements d’Avenir” or “Investments for the Future” was launched at the end of 2009. The ANR is the operator for the research and higher education component of this programme, which covers 21.9 billion euros. Such a programme has a structuring and integrating purpose, and is part of a long-term and dynamic drive to transform higher education, research and innovation. These large-scale initiatives promoting excellence will strengthen France’s capacities for innovation and be a driving force in the dynamics of growth in the coming years.

Competitive calls were organised in two waves and 14 calls for proposals were launched in 2010. Alongside the contractualisation of the projects selected in 2010, a second wave comprising about ten calls for proposals was launched during 2011, as an extension of the first wave.

By virtue of their exceptional nature, the Investments for the Future have some particularities. The project assessments were always conducted by international panels, with the project selection criteria being defined according to the priorities for Investments for the Future. The amount of funding assigned to the chosen projects is quite substantial, and covers “ten-year projects”, opening up new perspectives and leading to collaborative associations that would otherwise never have existed. Furthermore, they enable not only the financing of large-scale research projects, but also the implementation of new “objects” such as intermediate-size research equipment, infrastructure for research into biology-health, and the emergence of global research and higher education clusters.

Project selection criteria

- Scientific excellence
- Potential for innovation and technological disruption
- Investment in high-level training
- Acquisition of knowledge and know-how and transfer to the socio-economic sphere, value creation strategy
- Governance efficiency, quality of the development plan and management over the long term
- Positioning with respect to the territorial policies, competitiveness clusters, the National Strategy for Research and Innovation (SNRI), and European policies

// CENTRES OF EXCELLENCE

INITIATIVES OF EXCELLENCE IDEX

This is one of the flagship operations of the Investments for the Future programme, which, by using international-level research as a lever and an engine, intends to induce the emergence in France of a limited number (5 to 10) of world-class multidisciplinary clusters of excellence in higher education and research.

WAVE 1	WAVE 2
SUBMITTED PROPOSALS	
17	15
SELECTED PROJECTS	
3	-
SELECTION RATE	
18%	-

LABORATORIES OF EXCELLENCE LABEX

The aim of this initiative is to select Laboratories of Excellence, and give those with international visibility the means to compete with their foreign counterparts on an equal footing, to attract researchers and professors/researchers of international renown and to build an integrated policy of high level research, training and value creation.

WAVE 1	WAVE 2
SUBMITTED PROPOSALS	
241	195
SELECTED PROJECTS	
100	-
SELECTION RATE	
41%	-



EQUIPMENT OF EXCELLENCE EQUIPEX

The call for proposals aims at providing French research with scientific facilities of very high quality, which comply with international standards and play a key developmental role at national level. These facilities will contribute to the implementation of competitive projects on the international scale. The selected projects cover all scientific fields, from the creation of an observatory of the written legacy of the Middle Ages and the Renaissance in social sciences and humanities, to the construction of an experimental aquatic ecology platform for environmental sciences, and topics in applied robotics.

WAVE 1	WAVE 2
SUBMITTED PROPOSALS	
331	270
SELECTED PROJECTS	
52	41
SELECTION RATE	
16%	15%

INITIATIVES OF EXCELLENCE IN INNOVATIVE TRAINING IDEFI

This action aims at enhancing the prestige of innovation in training by supporting ambitious initiatives that meet up to the international and emblematic standards of the university offering of the future. The challenge is to promote true “demonstrators” that foreshadow university training of the future through new systems, new training procedures, new content and new methods.

WAVE 2
SUBMITTED PROPOSALS
95

RESEARCH HOSPITALS IHU

The aim of this initiative is to finance centres of excellence in research, care, training and technology transfer in the field of health. Six Research Hospitals Institutes (IHU) have been selected, thereby bringing together a critical mass of researchers, professors, and hospital personnel focusing on priority health topics within an integrated structure comprising a university, a university hospital centre or a public service health care research institution, and public research centres.

WAVE1
SUBMITTED PROPOSALS
19
SELECTED PROJECTS
6

RESEARCH HOSPITAL ONCOLOGY CENTRE PHUC

This call for proposals aims at giving France a research hospital centre of excellence specialised in research, training and innovative treatments in oncology.

WAVE 2
SUBMITTED PROPOSALS
3

// VALUE CREATION / VALORISATION

SOCIETIES FOR ACCELERATING TECHNOLOGY TRANSFER

SATT

The purpose of the SATTs will be to group together all the university site value creation teams and put an end to the dividing up of structures in order to significantly improve the efficiency of technology transfer and the economic value created. They should lead to greater professionalisation in the creation of value from research and strengthen skills.

WAVE1
SUBMITTED PROPOSALS
15
SELECTED PROJECTS
9
SELECTION RATE
60%

TECHNOLOGICAL RESEARCH INSTITUTES

IRT

The aim of this action is to create a limited number of technological innovation campuses of a global dimension grouping training institutes, public and private research laboratories, prototyping and industrial demonstration resources, industrial players, essentially on the same site, thereby reinforcing the ecosystems made up by the competitiveness clusters.

WAVE1
SUBMITTED PROPOSALS
15
SELECTED PROJECTS
8
SELECTION RATE
53%

INSTITUTES OF EXCELLENCE IN DECARBONIZED ENERGIES

IEED

The aim is to set up, in the energy and climate sectors, a limited number of technological innovation campuses capable of acquiring a global dimension. They are to group together training institutions, public and private applied research laboratories, prototyping and industrial demonstration means, and industrial and service players, essentially on the same site, thereby reinforcing the ecosystems made up by the competitiveness clusters. This call for proposals concerns the energy pathways that hold promise for the future.

WAVE1
SUBMITTED PROPOSALS
19
SELECTED PROJECTS
8
SELECTION RATE
42%

// HEALTH BIOTECHNOLOGIES

6 CALLS FOR PROPOSALS WERE LAUNCHED IN THE FIELD OF HEALTH BIOTECHNOLOGIES

- BIOINFORMATICS
- BIOTECHNOLOGIES AND BIORESOURCES
- COHORTS
- PREINDUSTRIAL BIOTECHNOLOGY DEMONSTRATORS
- NATIONAL INFRASTRUCTURE IN HEALTH AND BIOTECHNOLOGIES
- NANOBIOLOGIES

// DEVELOPING EUROPEAN & INTERNATIONAL COOPERATION

The role of the ANR includes increasing the scientific outreach of French research, intensifying transnational collaborations with our European and international partners, promoting the access of French scientific communities to international bodies, venues and debates, and establishing special relations with the major foreign funding agencies in order to co-fund transnational projects. The ANR thus places the development of European and international collaboration among its priorities.



In order to better respond to the major environmental and societal issues (global crisis, climate change), and make faster progress in the major challenges to knowledge, it is vital to join forces and pool resources. International collaborations can be a vector for enhanced effectiveness, by enabling a critical mass to be reached in areas where national resources are in short supply, and by providing access to new know-how and data.

By speeding up and increasing the depth of the collaborations initiated by the French researchers and research organisations, ANR's international policy aims more particularly at optimising the position of French research teams in the global competition.

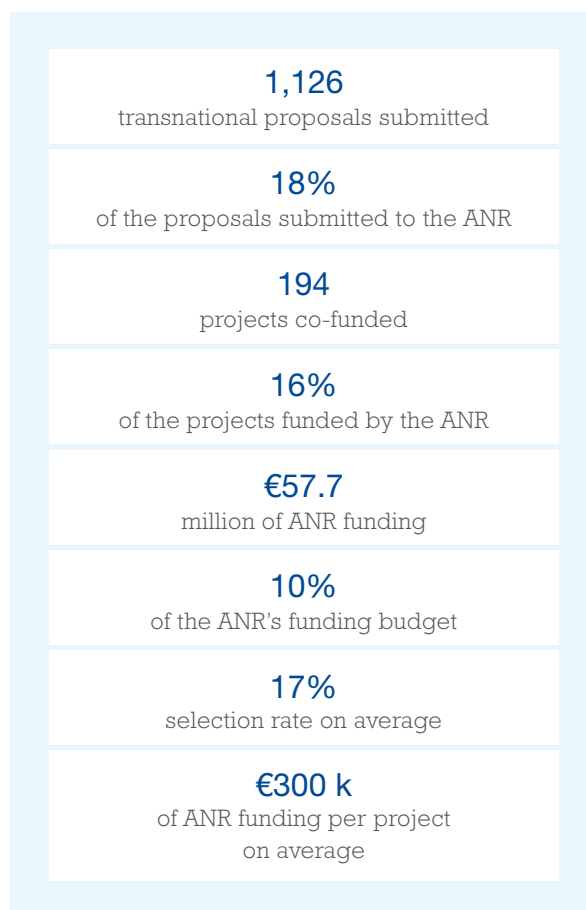
The transnational collaborations of ANR are integrated insofar as possible in its national programme planning, in both the thematic priorities and the budget. ANR programme planning takes into account the international dimension of the subjects, and a large number of its thematic programmes have an international component through participation in an ERA-NET or the mutual opening of programmes in relation with one or more foreign agencies. The thematic transnational programmes are discussed in the ANR Strategy and Planning Board meetings. Though the transnational projects are similar to the national projects in quality and budget, the costs are shared, with each country funding its own teams.

Under its transnational policy, the ANR naturally turns towards Europe: it contributes actively to the development of the European research area by creating close ties with the European commission and the European research funding agencies. It takes part in the EU initiatives, such as the ERA-NETs, and is a driving force in the European joint programming initiatives. Internationally, it undertakes to develop lasting relations with the emerging countries on the scientific scene, such as China, India and Brazil. It endeavours to make ties with leading countries in certain key domains.

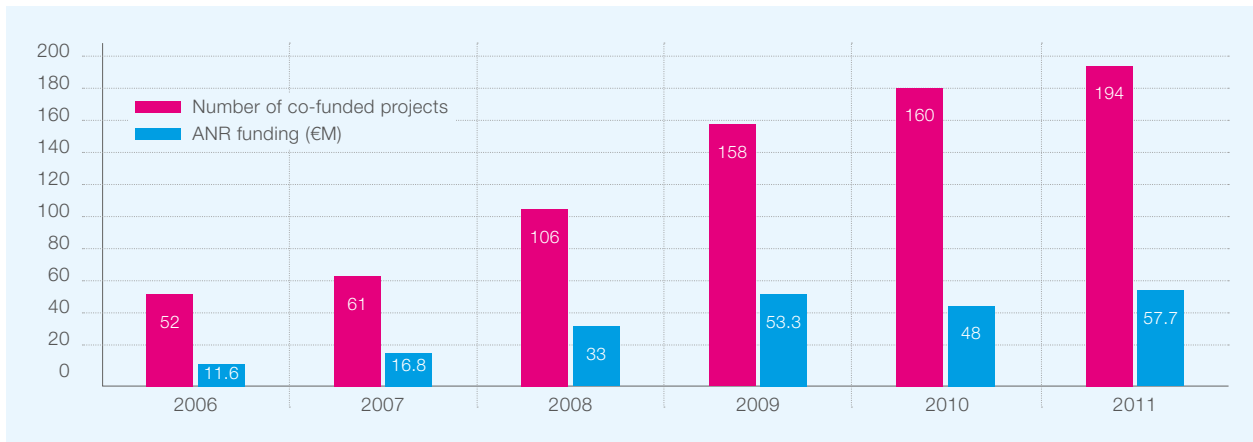
To do this, the ANR creates strategic bilateral or multilateral partnerships with its foreign counterparts, and funds true collaborative transnational projects concerning subjects in which the countries have a shared interest.

// SUSTAINED & DIVERSIFIED TRANSNATIONAL COLLABORATIONS

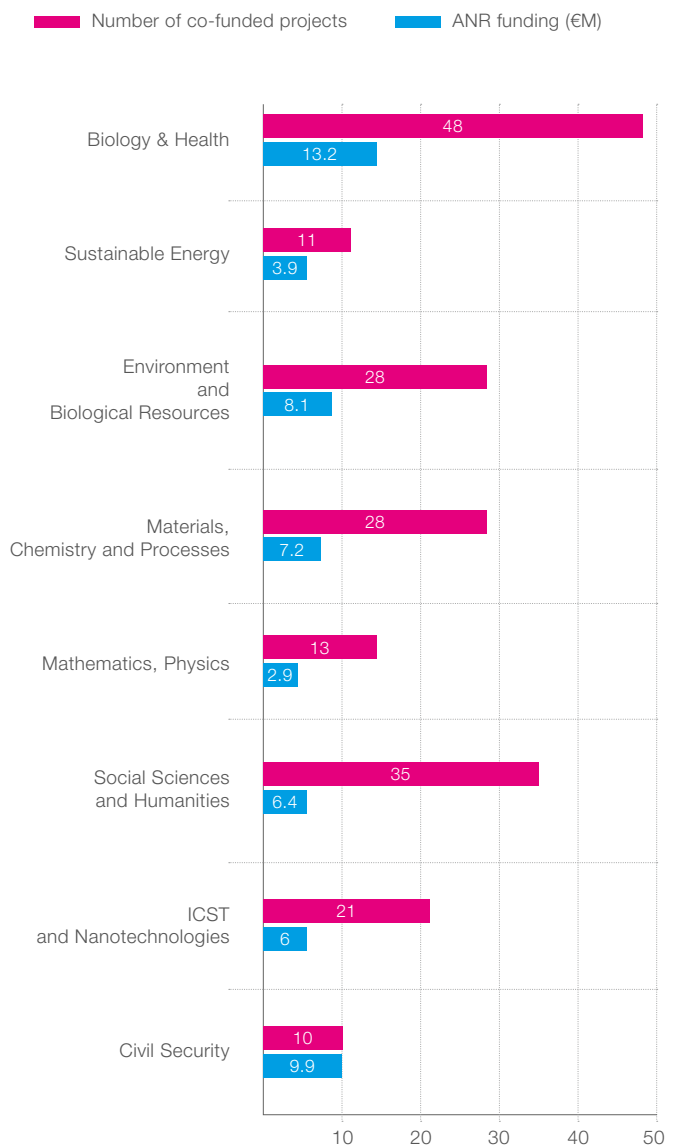
✓ KEY FIGURES



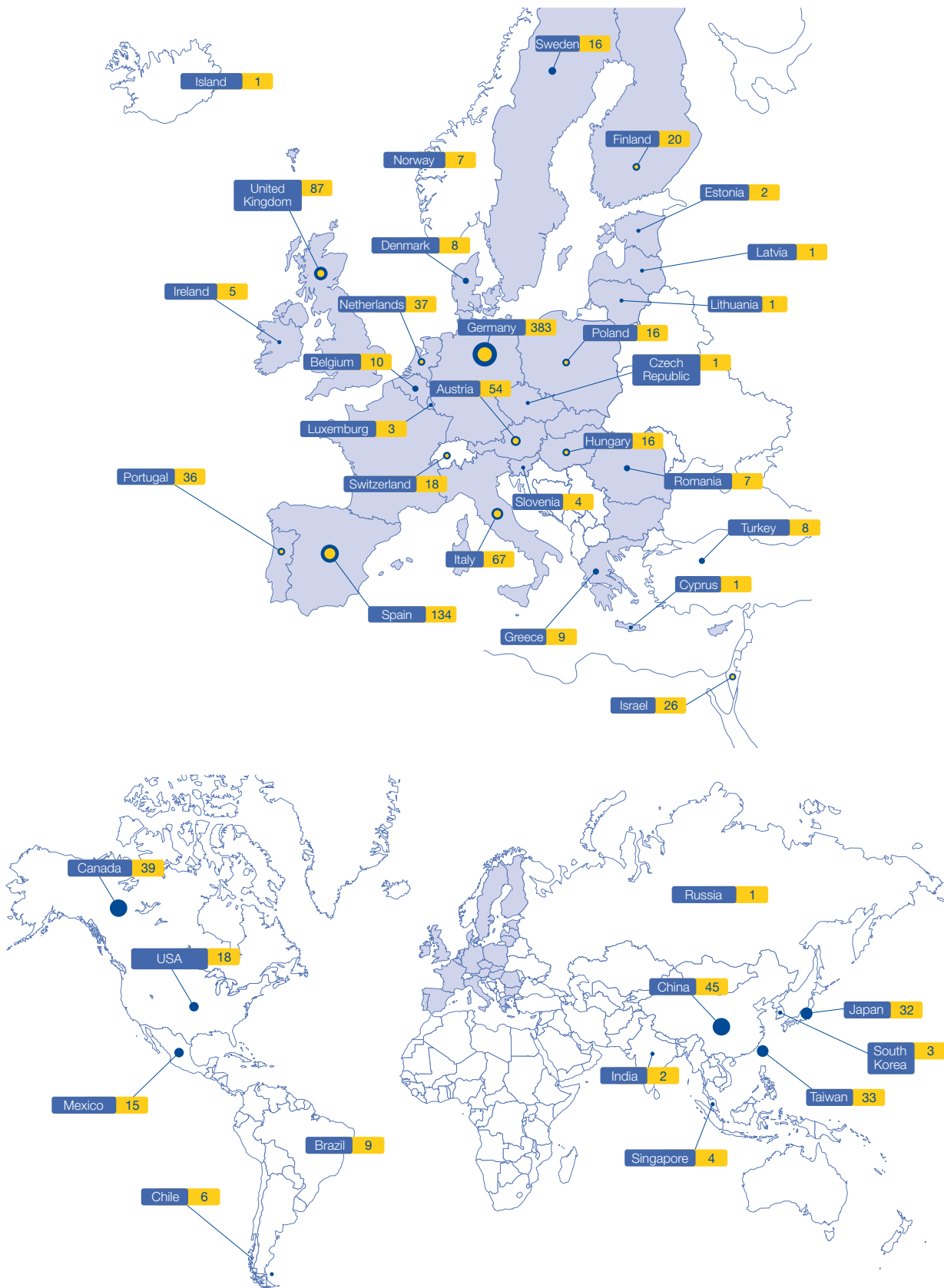
✓ **DEVELOPMENT OF TRANSNATIONAL COLLABORATIONS 2006-2011**



✓ **THE TRANSNATIONAL COLLABORATIONS IN 2011 CONCERN ALL THE THEMES**



✓ PROJECTS FUNDED BY COUNTRY
(2006-2011)



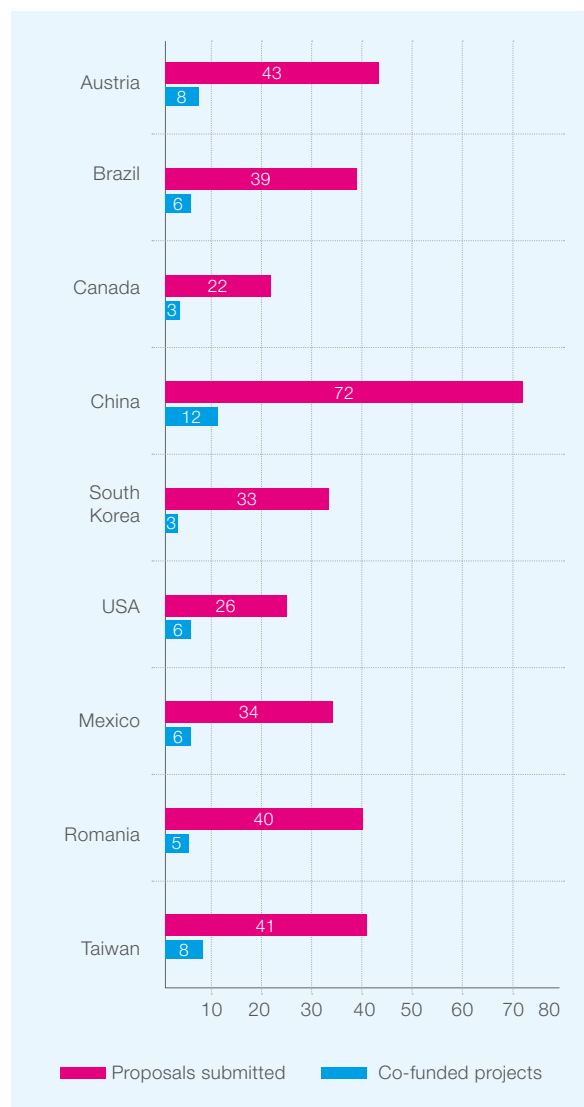
// THE COOPERATION INSTRUMENTS

THE ANR FUNDS TRANSNATIONAL PROJECTS USING TWO DIFFERENT SCHEMES:

- The launching of calls for proposals for joint projects dedicated specifically to bilateral or multilateral collaborations, including the calls made in the context of EU FP7 tools such as the ERA-NETs and article 185 (ex 169). These dedicated transnational calls are characterised by a common call for proposals text and the setting up of a joint evaluation panel of international experts. This type of call represented 64% of the transnational collaborative projects funded by the ANR in 2011.

- The opening of part of the ANR's national programmes to transnational collaborations. Contrary to the dedicated calls, there is no dedicated common call for proposals text or joint evaluation panel, but the agencies agree beforehand on the joint conditions of selection and funding. The projects are assessed by the two agencies at the same time. This is particularly the case with the CSOSG programme on security, which is open to Franco-German projects under an agreement signed with the BMBF. The TecSan programme on technologies for health is also open to Franco-Taiwanese collaborations in partnership with the NSC. The Blanc International programme, whose 2011 edition was open to 9 countries and allowed the funding of 57 projects, to which the ANR contributed €15.2 M, is another example of programme opening to transnational collaborations.

✓ BLANC INTERNATIONAL PROGRAMME 2011 BY COUNTRY:



// EUROPE AS A PRIORITY

Collaborations with European partners represented 62% of the ANR's transnational collaborations in terms of co-funded projects in 2011, and 71% of its funding. Through binational and multinational calls covering a broad spectrum of themes, the ANR co-funded 120 projects with European funding agencies, that is to say 9.3% of all the ANR's projects.

MULTILATERAL PROGRAMMES IN THE EU INITIATIVES

The ANR participates in multilateral calls alongside numerous European partners in the framework of EU initiatives such as the ERA-NETs, with the aim of reinforcing European research in the targeted domains. The ANR is partner to some twenty ERA-NETs. The projects funded further to the ten calls for proposals launched in 2011 for these ERA-NETs represent 28% of the ANR's transnational projects. Since 2010, ANR has coordinated the CHIST-ERA ERA-NET, a consortium of twelve European countries rallying to address long-term challenges in the field of ICST. It is also a member of the European association AAL 185, the Ambient Assisted Living joint programme, and participates in the calls for proposals each year. It is an active player in the EC's joint programming initiatives (JPI), and participated more particularly in the first call launched by the JPI in the field of neurodegenerative diseases (JPND) in 2011. The ANR is also a member of the governing bodies of certain JPIs such as FACCE on agriculture, food and nutrition safety, and climate change.

At institutional level, the ANR programme directors take part in the GTN (national thematic groups) discussions, which enables them to better combine the EU's 7th Framework Programme and ANR programme planning, and play a role in the programme planning process at community level. The ANR also represents France within the "Ideas" committee of the European Research Council (ERC). It has been a member of the European Science Foundation (ESF) since 2007, and is a member of the Science Europe association created in 2011. It is also a member of the G8HORCS (Heads of Research Councils of the G8 countries) and of the GRC (Research Council Grouping of the G20 countries and the OECD member countries).

✓ EUROPE / INTERNATIONAL DISTRIBUTION

EUROPE	INTERNATIONAL
PROPOSALS SUBMITTED	
663	463
CO-FUNDED PROJECTS	
120	74
ANR FUNDING (€M)	
41.1	16.6



GERMANY IS THE ANR'S LEADING PARTNER

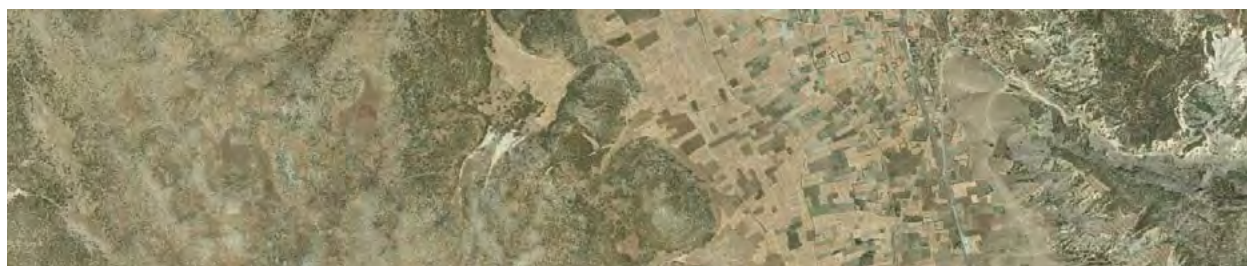
The ANR fosters special relations with Germany, collaborating with the DFG and the Ministry of Research (BMBF) on bilateral and multilateral projects, particularly in the context of the ERA-NETs and the G8 Research Councils Initiative on Multilateral Research Funding.

In 2011 the ANR renewed its collaboration with the DFG in the field of chemistry, co-funding a total of 15 Franco-German projects. The CSOSG call for proposals, which is traditionally open to the BMBF, was reserved this year exclusively for Franco-German collaborations in the field of security.

Since 2007, the ANR and the DFG have jointly launched a call for proposals in social sciences and the humanities, which has been an unquestionable success.

✓ FRANCO-GERMAN COLLABORATIONS BY THEME IN 2011

THEMATIC DOMAIN	CO-FUNDED PROJECTS
Biology & Health	28
Sustainable Energy	4
Environment and Biological Resources	6
Materials, Chemistry and Processes	17
Social Sciences and Humanities	18
ICST and Nanotechnologies	5
Civil Security	10



FOCUS

KELAINAI

Apamea Kibotos and its area: a royal residence in Phrygia

Franco-German programme in SSH 2007



▲ © Rights-managed

FRANCO-GERMAN RESEARCH INTO HISTORY AND ARCHAEOLOGY IN ASIA MINOR

Joining the skills of a French team specialized in epigraphy, history and the more technical fields of ceramology, geophysics and geocomputing, with that of a German group of experts on urban and funerary archeology as well as architecture, the project has allowed the first systematic survey of the remains of the Kelainai site (modern Dinar, Turkey). The city was an important ancient trade centre and a royal Achaemenid residence, in the frontier region between Lydia and Phrygia. Also conducted with Turkish archaeologists working in the area, this research has led, through three survey campaigns to: 1) the establishment of a first overview regarding the development of the site; 2) a marking out of the urban topography of the ancient city (location of the most important sites: royal palaces, acropolis, agora, etc.) and the organisation of its territory (necropolis, secondary sites, infrastructural elements); 3) first conclusions regarding hitherto unknown buildings, thanks to the study of architectural elements; 4) the discovery of 92 carved inscriptions, of which 72 are original; 5) the creation of a Geo-referenced information system (GIS) to register 400 objects and structures, including 200 rock-cut tombs.

The project has opened broad perspectives for the knowledge of Kelainai's history, particularly regarding the study of its economic importance and the Persian influence in Asia Minor.

Askold Ivantchik // ivantchik@u-bordeaux3.fr

// BILATERAL RELATIONS WITH INTERNATIONAL PARTNERS

STRENGTHENING OF RELATIONS WITH ASIA

Since 2007 the ANR has developed very good relations with the research agencies of the Asian countries.

The "Great Tohoku Earthquake" Flash call launched in 2011 with the JST in Japan, further to the earthquake and tsunami that hit the country in March 2011, has reinforced Franco-Japanese cooperation on these themes. The 9 projects selected focus equally well on earth sciences as on the environmental and societal impact, engineering sciences, crisis management, interplay between natural and technological risks, the resilience of the environment and reconstruction.

The ANR also renewed its partnership with China's NSFC, the ANR's leading non-European partner. A joint call for proposals with South Korea was launched for the first time in 2011.

Lastly, Taiwan was the first non-European partner with which the ANR signed an agreement back in 2007 and since then its collaboration with the NSC has been regularly renewed. In 2011, the ANR and the NSC organised a follow-up workshop in Taipei, bringing together the majority of the Franco-Taiwanese projects funded since 2007.

CONTINUATION OF COLLABORATIONS WITH NORTH AMERICA

Canada is the ANR's main partner in North America, and its second non-European partner. The ANR has been working with the NSERC since 2009 in the framework of the Blanc International programme. The ANR also cooperates with Canadian partners in multi-lateral calls such as the META call for proposals concerning the metabolic syndrome and associated diseases, alongside Spain and Germany, as well as in the ERA-NETs in which Canada is regularly an associate partner. Lastly, the ANR is also the partner to Quebec, with the FQRSC in the social sciences and humanities in 2011, for example.

The ANR has moreover created partnerships with the NSF in the USA through its collaborations in chemistry and materials in the framework of the NSF's "International Collaboration in Chemistry, ICC" and "Materials World Network, MWN" programmes.

FRENCH-TAIWAN EXPLORATION OF THE SOLAR SYSTEM BEYOND NEPTUNE

BEYOND NEPTUNE

Exploring the solar system beyond Neptune using stellar occultations

Blanc International programme 2008



▲ An artist's view of Eris, as presented in a press release of the European Southern Observatory at the publication of their results in the October 27, 2011 issue of the journal *Nature*. One can see the very shiny aspect of the dwarf planet, probably caused by a frozen nitrogen atmosphere that creates a thin coating measuring about one millimetre in thickness. Eris is very close in size to Pluto, and is presently the farthest and coldest object observed in our solar system.

Using the French and Taiwanese teams' expertise in the stellar occultation technique, the project has been able to measure the physical parameters of several bodies orbiting beyond Neptune (the so-called "trans-Neptunian objects", or "TNOs"). Over 3 years they have organised some forty campaigns which have served to monitor Pluto's atmosphere, measure the size of its satellite Charon, and, for the first time ever, determine the sizes and shapes of 5 TNOs: Varuna, Eris, 2003 AZ84, Makemake and Quaoar, and provide upper limits for their atmospheres at the nanobar level. In a letter in *Nature* (Oct. 2011), they show that Eris is a body very similar in size to Pluto, but with a much more reflective surface which makes it one of the brightest objects in the solar system, and which probably stems from a thin coating of frozen nitrogen. Moreover, they hope to detect small TNOs on the kilometric scale via random occultations. In this context, the COROT satellite has detected 15 events that are being analysed, and could be the signature of small TNOs. Their work brings in fine constraints on the origin and evolution of the outer parts of our solar system.

Bruno Sicardy //
bruno.sicardy@obspm.fr



OPENING UP TO LATIN AMERICA

The ANR funded seven projects with Brazilian partners in 2011. As in 2010, the global environmental changes and societies (CEP&S) programme was open to Franco-Brazilian collaborations further to the signing of an agreement with the FAPESP agency of the State of Sao Paulo and the FACEPE agency of the State of Pernambouco. This same partnership was initiated in the Blanc International programme in 2011. Another Franco-Brazilian collaboration was created between the ANR and the CNPq, on the shared interest themes of mathematics, physics and biodiversity.

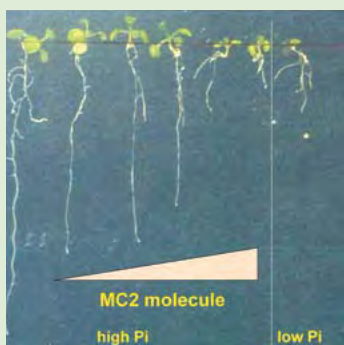
The ANR also continued its partnership with the CONACYT in Mexico, by launching its third consecutive Franco-Mexican call for projects in 2011.

FOCUS

- FOSSI
Phosphate signalling
- Plant KBBE
Programme 2008

FRANCO-GERMANO-SPANISH COLLABORATION ON PHOSPHATE SIGNALLING:

New perspectives for plant fertilizers



▲ © Rights-managed

Phosphorus is an essential macronutrient for plant growth, development and productivity. Many soils are naturally low in plant-available inorganic phosphate (Pi). Fertilizers represent not only a considerable expense for producers, but also an ecological risk due to leaching in soils. Plant roots detect Pi in their environment and adapt their growth according to Pi concentration: in low P soils, root growth is reduced. The project helps elucidate the mechanisms of phosphate signalling. The picture illustrates the effect of one molecule mimicking the effect of Pi starvation on root growth. In the presence of this molecule, phosphate signalling is disrupted, phosphate uptake is no longer regulated and the nutrient accumulates in the plants. The search for mutants resistant to such molecules led to the identification of plants displaying better development in limiting phosphorus conditions. The results demonstrate that the growth adaptation relative to phosphate signalling is under genetic control and does not only result from the metabolic effect of this ion.

The gathering of the three academic partners from France, Spain and Germany under the umbrella of the Plant-KBBE Project has led to an exchange and amalgamation of complementary expertise and approaches, and forged an unprecedented European network with global competitiveness in phosphate signalling research.

Laurent Nussaume // lnussaume@cea.fr

ADHRES
Signature project

ERA-NET PATHOGENOMICS
programme 2008

EUROPEAN COLLABORATION ON THE UNDERSTANDING AND DIAGNOSING OF BACTERIAL RESISTANCE

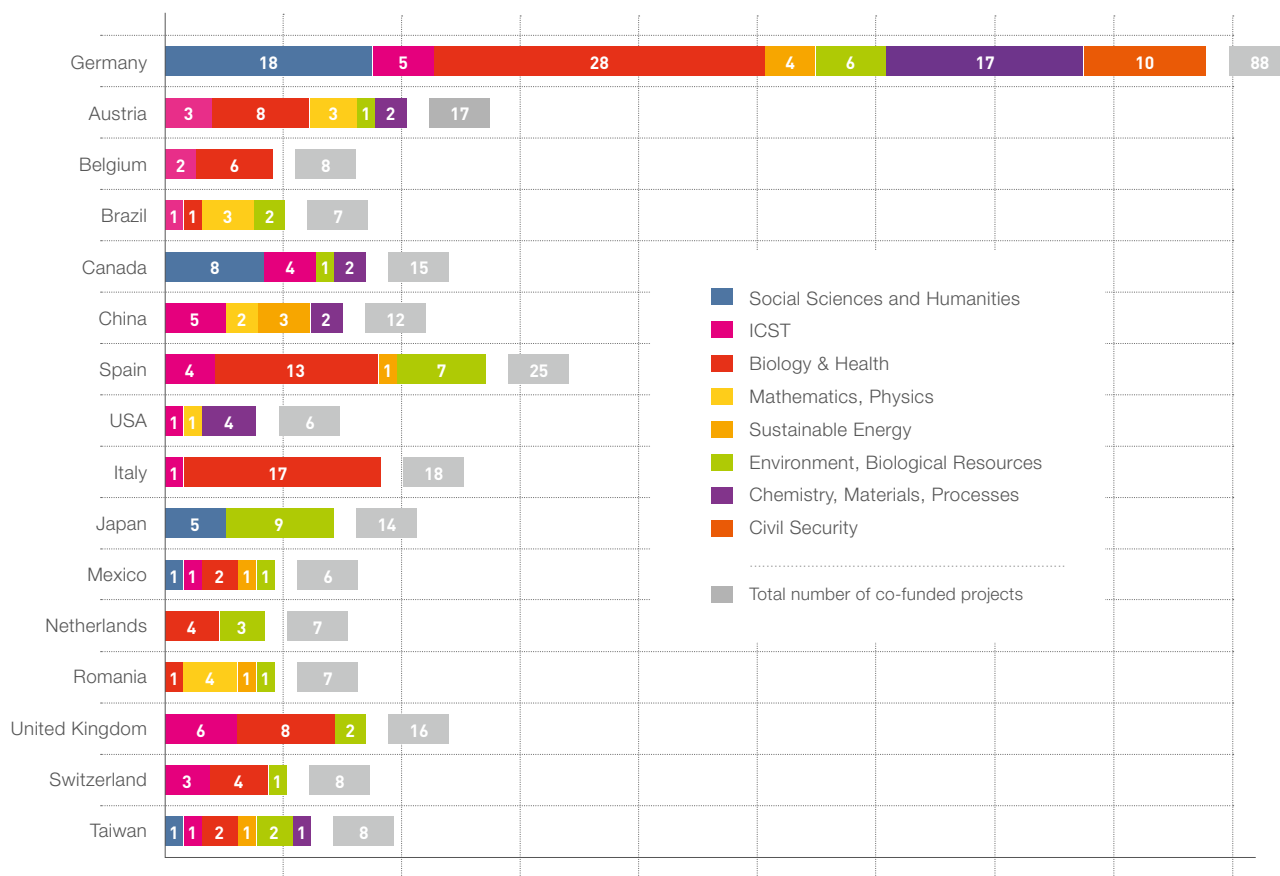


The sedentary lifestyle of bacteria in biofilms is an aggravating factor in bacterial infections and represents a major therapeutic problem: it limits the penetration of antibiotics and promotes the acquisition of new resistance genes. The objective of the ADHRES project was to understand how the molecular nature of the bacterial biofilm matrix (ADH) conditions antibiotic resistance (RES) in pseudomonas-related species (*Pseudomonas aeruginosa*, *Pseudomonas putida* and *Burkholderia cepacia* complex (Bcc)). Using systematic transposon mutagenesis in different clones isolated from patients and their high throughput phenotypic screen for resistance and adhesion, this collaborative transnational project has unravelled and characterized new ADH and RES genes that were further confirmed to play a role in acute or chronic infections using transcriptomic and proteomic analyses from freshly isolated clones, further confirming particular ADHRES signatures in human infections. This approach has also enabled the identification of “new” resistance mechanisms before their emergence. This ADHRES signature can therefore be used as a diagnostic and prognostic tool in the patient, and a basis for developing new à la carte therapeutic antibacterial or anti-infective treatments.

▲ © Rights-managed

Sophie de Bentzmann // bentzman@ibsm.cnrs-mrs.fr

✓ MAIN ANR COLLABORATIONS BY THEME IN 2011





✓ THE ANR'S BINATIONAL PARTNERSHIPS IN 2011

	PARTNER ORGANISATION		THEMES
GERMANY	▶ DFG	Deutsche Forschungsgemeinschaft	Social sciences and humanities, Chemistry
	▶ BMBF	Bundesministerium für Bildung und Forschung	Energy, Environment, Security, Health, ICST, Food, Land transports
AUSTRIA	▶ FWF	Fonds zur Förderung der wissenschaftlichen Forschung	Mathematics, Physics
BRAZIL	▶ FAPESP	Fundação de Amparo à Pesquisa do Estado de São Paulo	Planetary environmental changes. Earth science, Environment
	▶ FACEPE	Fundação de Amparo à Ciência e Tecnologia de Pernambuco	
	▶ CNPq	Conselho Nacional de Desenvolvimento Científico e Tecnológico	Mathematics, Physics, Biodiversity
CANADA	▶ NSERC	Natural Sciences and Engineering Research Council of Canada	Manufacturing, ICST, Natural sciences and environment technologies, Natural resources and energy
QUEBEC	▶ FQRSC	Fonds québécois de la recherche sur la société et la culture	Social sciences and humanities
CHINA	▶ NSFC	National Natural Science Foundation of China	ICST, Nanotechnologies, Engineering sciences
	▶ MOST	Ministry of Science and Technology of China	Ecotechnologies, Water
SOUTH KOREA	▶ NRF	National Research Foundation of Korea	ICST and nanotechnologies, Biotechnologies and health
USA	▶ NSF	National Science Foundation	Chemistry, Materials
JAPAN	▶ JSPS	Japan Society for the Promotion of Science	Social sciences and humanities
	▶ JST	Japan Science and Technology Agency	Great Tohoku Earthquake
MEXICO	▶ CONACYT	Consejo Nacional de Ciencia y Tecnología	Biology & health, Environment, ICST, Energy
ROMANIA	▶ ANCS	Autoritatea Nationala pentru Cercetare Stiintifica	Physics, Environment, Ecosystems and biodiversity
TAIWAN	▶ NSC	National Science Council	Biotechnology and agriculture, Health and genomics, Nanosciences and nanotechnologies, ICST, Technologies for health, Social sciences and humanities

// FOSTERING THE EMERGENCE OF NEW KNOWLEDGE & THE PRODUCTION OF INNOVATIVE CONCEPTS

Fostering the production of knowledge and scientific progress in all disciplines is one of the ANR's scientific priorities. The Agency favours a creative environment for researchers by giving them total freedom to defining research themes through complete bottom-up calls for proposals, thereby paving the way for advances in S&T and innovative developments.

BOTTOM-UP PROGRAMMES: supporting curiosity driven research

These programmes cater for the scientific community as a whole and accompany the researchers in different stages of their career:

1

Blanc Programme

2

Chairs of Excellence Programme

3

Postdoctoral Return Programme

4

Young Researchers Programme

5

Blanc International Programme

The only rationale that prevails is the acknowledgement of excellence and the support given to innovative or interdisciplinary approaches in order to open new paths in research and thus push back the frontiers of knowledge. The projects financed under the bottom-up programmes thus foreshadow striking scientific discoveries.

The year 2011 saw a consolidation of the attractiveness of all the agency's bottom-up programmes, with their share of ANR funding budget stabilising at 50%. This consolidation gives the entire scientific community the opportunity to express its creativity in full, from the most fundamental research through to applied and partnership-based research, and to stimulate cooperation between teams from different laboratories or countries. This major development reveals a strategic choice that allows the free submission of research projects without any form or prior orientation or planning.

Due to their regularity and stability, these programmes have become one of the key milestones punctuating the life of the research laboratories.

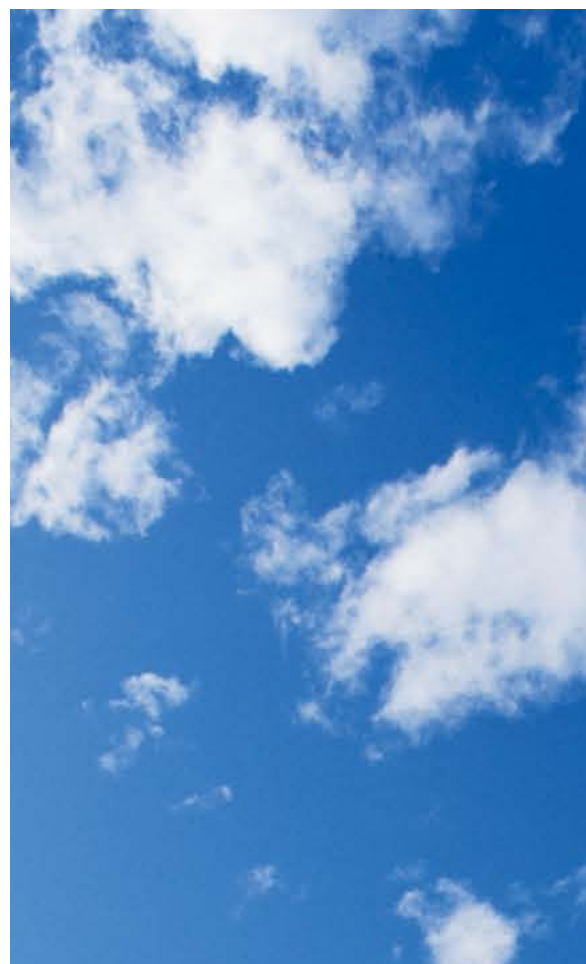


// BLANC PROGRAMME

FOSTERING RISK TAKING AND AUDACITY IN SCIENCE

This 'blue-sky' programme covers the entire research spectrum and gives significant impetus to ambitious projects at the cutting edge of traditional research paths. Researchers from all disciplines can submit a project on any topic they choose. It is open to all types of research: basic, fundamental and applied, as well as to partnerships with industry.

By creating know-how and pushing back the frontiers of knowledge, these research actions lead to a better understanding of our world and facilitate the emergence of innovations that enhance our living conditions.



✓ BLANC PROGRAMME 2011: PROJECTS PER DISCIPLINARY AREAS

DISCIPLINARY AREAS	SUBMITTED PROPOSALS	FUNDED PROJECTS
Societies, space, organisations and markets	74	14
Human development and cognition, language and communication	50	10
Cultures, arts, civilisations	68	13
Mathematics and interactions	64	20
Computer science and applications	70	17
Hardware and software for systems and communications	69	14
Physics	148	30
Environment, Earth and space	154	31
Molecular, organic, coordination chemistry, catalysis and biological chemistry	163	33
Solid-state Chemistry, colloids, physical chemistry	91	18
Engineering sciences, materials, processes, energy	182	41
Nanosciences	88	18
Physiopathology, physiology, public health	187	36
Cell biology, developmental biology	148	29
Microbiology, immunology, infectiology	147	28
Neurosciences	149	28
Physics, life chemistry and biotechnological innovations	150	28
Genomics, genetics, bioinformatics, systems biology	88	18
Biodiversity, evolution, ecology, and agronomy	141	28
Biochemistry, molecular and structural biology	129	26

// CHAIRS OF EXCELLENCE PROGRAMME

PROMOTING THE ATTRACTIVENESS OF FRANCE

The hosting of high-level foreign researchers in French laboratories plays a crucial role in enhancing the attractiveness of France in the international context.

The top candidates make their choices according to key factors such as living and working conditions, and the ready availability of project management resources.

“Chairs of excellence” is a programme that provides substantial means for top researchers from abroad willing to set up a team and rapidly undertake ambitious research projects in France. Such a programme is vital to reinforce the country’s innovation potential as well as the structuring of new research themes.

3 types of chair are proposed according to the project duration and the researcher’s career, whatever his/her nationality or discipline: junior and senior chairs for long duration (36 to 48 months) and senior chairs for a shorter duration (18 to 24 months).

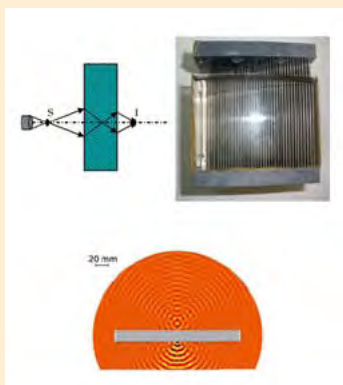


FOCUS

SUPREME

SUPerlens with negative
REfraction based on
MEtamaterials and phononic
crystals

Blanc programme 2008



▲ Principle of negative refraction and focusing device made up of steel rods in epoxy (numerical simulation of the fabricated device).

WORKING TOWARDS A NEW ACOUSTIC IMAGING METHOD THAT BREAKS AWAY FROM CONVENTIONAL ULTRASONIC ECHOGRAPHY

The current trends in ultrasonic imaging are greatly evolving, with the quest for higher resolution leading to devices functioning at higher frequencies. The SUPREME project studies solutions in this field using materials displaying negative refraction properties, by using the “superlens” effect to increase resolution. Two solutions have been adopted to obtain the negative refraction property: (1) the use of phononic crystals (periodic arrangements of several materials) displaying dispersion curves with a negative slope, a property that can be used to focus acoustic waves; (2) the use of metamaterials (composite materials containing particularities on a smaller scale than the wavelength), which are endowed with negative refraction. During the project, solid-matrix negative refraction systems have been designed and produced, the previous studies being relative to fluid-matrix systems. In addition, the negative refraction index is a property that allows the production of flat lenses. These superlenses, which are subject to intense study for their super resolution properties (production of an image containing smaller details than the diffraction limit), also functioning like a field-copy that creates a real image from a real object. This capacity to copy a field, which is currently being verified experimentally, enables a new method of acoustic imaging to be envisaged, that breaks away from conventional ultrasonic echography.

Anne-Christine Hladky //
anne-christine.hladky@isen.fr

CLIM

Adaptation to a changing climate and the genetic basis of flowering time variation in pearl millet

Young Researchers programme
2007



▲ © Ton Rulkens <http://www.flickr.com/photos/47108884@N07/4545169813/>

CLIMATE CHANGE AND FOOD SECURITY:

Adaptation to climate change in the Sahel and evolution of pearl millet precocity

Climate change will have major impacts on the security of food supplies in the Southern countries. One of the regions in which the impact will be greatest is the sub-Saharan zone. The studies of this project concern the adaptation of plants to these climate variations, and the model used is millet, a major cereal of the Sahelian zone. Since the early 1970's, the Sahel has been going through a relatively dry period with a succession of droughts that have resulted in the isohyets shifting southwards by an average of 100 to 200km. Samples are available from the beginning of the period (1976) and more recently (2003) in 79 villages covering the Niger. Comparison of the morphological and phenological evolution of the varieties of millet over these 79 sampling points has revealed a shortening of the flowering cycle. This study taken as a whole brings the conclusion that the diversity within the traditional varieties of millet has allowed adaptation to the climatic variations, leading to the selection of more precocious varieties. But one of the most significant results is the identification of the genes associated with this adaptation, providing a valuable means of tracking and promoting adaptation to the future climates in the Sahel.

Yves Vigouroux // Yves.vigouroux@ird.fr

3 // POST-DOCTORAL RETURN PROGRAMME

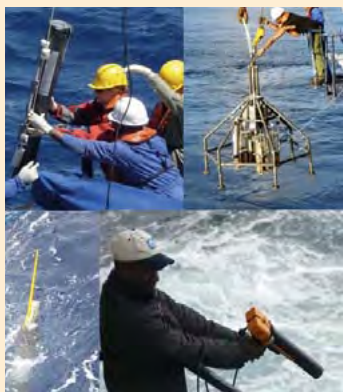
AVOIDING THE BRAIN DRAIN AND SUPPORTING THE RETURN AND INTEGRATION OF YOUNG RESEARCHERS

The need to reinforce the international attractiveness and the outreach of French laboratories implies providing optimum conditions for hosting high-level foreign researchers. In this spirit, the "Post-Doctoral Return Programme" aims at encouraging and facilitating the return of young French or foreign researchers to France. It provides each successful candidate with the necessary means to conduct a project in a host laboratory in France for a maximum period of three years. Ultimately, accomplishing ambitious projects should give the successful candidates prospects of being hired by research organisations or companies.



BONUS GOODHOPE

Blanc programme 2007



▲ The main objective of the BONUS-GoodHope project was to apply a multidisciplinary approach to the understanding of Southern Ocean processes and biogeochemical cycles. The project constitutes the most complete and multidisciplinary oceanographic cruise among all those organised within the IPY. During the mission, which lasted almost two months, the participants gathered an unprecedented collection of observations of the ocean, atmosphere and sediments using a large panel of instruments, some of which are shown in the above picture.

THE SOUTHERN OCEAN AT THE HEART OF OUR CLIMATE: an unprecedented international and interdisciplinary effort

In the framework of the International Polar Year 2007-2008, the BONUS-GoodHope international campaign enabled the ocean dynamics to the south of southern Africa, between the Cape of Good Hope and 57°33'S, to be studied from the surface to the ocean floor, by collecting a whole range of physical and biogeochemical data. Sixty-five international scientists embarked on the Oceanographic Research Vessel (R/V) Marion Dufresne chartered by the IPEV (French Polar Institute) and cofinanced by the ANR. The BONUS-GoodHope project has laid the foundations for long-term monitoring of the Southern Ocean, and providing a multidisciplinary vision of its role by bringing together physicists, biogeochemists and modellers. This was achieved by coupling the ocean dynamics with the biogeochemistry in the full-depth water column, the atmosphere and the sediment, and the study of the elements and isotopes tracing the lithogenic sources, the circulation and the ventilation of the water masses. The necessary parameters collected now serve as an international reference and are used to test and constrain numerical tools that propose a dynamic vision of this environment and how it evolves in relation to the climate.

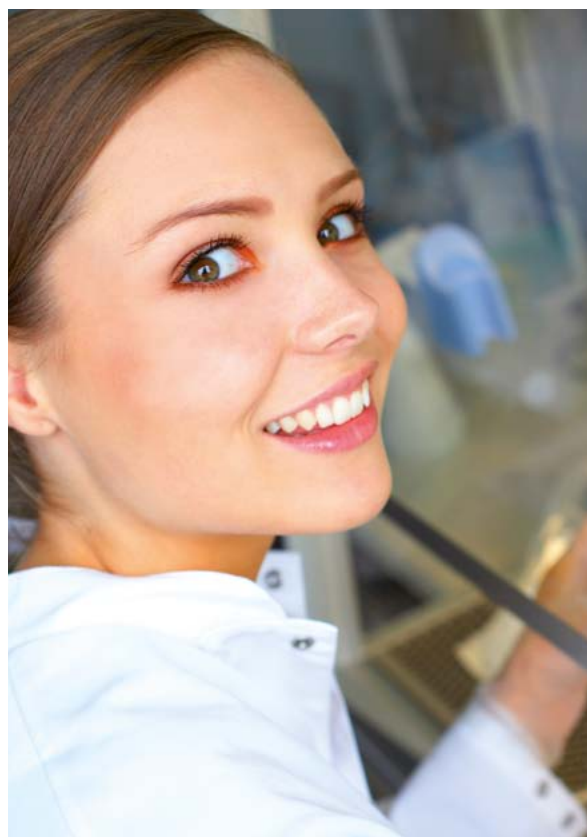
Sabrina Speich //
speich@univ-brest.fr

4

// YOUNG RESEACHERS PROGRAMME

ENCOURAGING AUTONOMY AND INNOVATIVE INITIATIVES

The ANR intends promoting scientists aged under 39 and helping them develop their own research themes, set up or consolidate research teams and give them the opportunity to rapidly express innovative initiatives by giving them strong support. The Young Researchers Programme can also be considered as a stepping stone for young French researchers applying to the ERC (European Research Council) starting grants programme.



5 // BLANC INTERNATIONAL PROGRAMME

GIVING RISE TO EUROPEAN AND INTERNATIONAL TEAMS OF EXCELLENCE

This programme provides significant stimulus to ambitious, original and competitive research on an international level. The ANR has concluded special cooperation agreements with targeted countries in specific and broad domains, thus giving French researchers the opportunity to initiate or further their scientific collaborations with foreign teams. Depending on the country, the programme is open to all kinds of research work, i.e. either only academic research or academic research as well as research conducted in public-private partnership.



MNC CONTROL

In search of efficiency and flexibility: organisation and control of Japanese and French Multinational firms in Asia

Blanc International programme
2008



▲ A street in Shanghai

A FRENCH-JAPANESE STUDY OF THE MANAGEMENT OF MULTINATIONAL COMPANIES IN ASIA

This project aimed at achieving a better understanding of how Japanese and French multinational companies are organised in Asia, an area they consider crucial to reconcile the somewhat contradictory objectives of efficiency on the one hand, and local flexibility on the other. The methodology used is based on a double crossing of perspectives: comparison of Japanese and French multinationals, from the point of views of both headquarters and subsidiaries. This research combines qualitative and quantitative approaches. The major results can be summarized as follows: (1) strong control of all activities of the subsidiaries by parent companies, both Japanese and French; (2) regional structures implemented in the large French multinationals but not in the Japanese ones, due to the differences in geographical distances and characteristics specific to the firms in the two countries; (3) higher level of expatriation in Japanese multinationals, but this is moderated by the nature of the subsidiaries and their competitive environment, and lastly (4) greater experience in the localisation of managerial positions localisation in the subsidiaries of French multinationals.

Jacques Jaussaud //
jacques.jaussaud@univ-pau.fr

THE ROLE OF MATHEMATICS IN UNDERSTANDING OCEANOGRAPHIC PHENOMENA

MATHOCEAN

Mathematical analysis in oceanography
and oceanographic applications

Blanc programme 2008



▲ Instrument measuring the complexity of coastal flows

The project has brought together several disciplines linked to oceanography to better describe the physical phenomena in question. The main advances concerned waves in the coastal environment, the interfaces between several fluids, and the boundary layers for rotating fluids. The photograph opposite (measuring instrument at Truc Vert beach) shows the complexity of the coastal flows; it is necessary to manage the steepening of the swell, the breaking of the waves and the determining of the flooded zones. A mathematical analysis enabled appropriate equations for describing these phenomena to be devised; the project then gave rise to the construction of a numerical code that uses the mathematical properties of the equations. Experimentally validated physical modelling allowed the digital processing of certain phenomena that cannot yet be described mathematically (such as wave breaking and uprush). In return, this modelling opens numerous mathematical possibilities. The code was used to highlight the importance of the dispersive effects in forecasting the maximum heights of the waves reaching the coast. This study is of direct value in the construction of structures to protect against tsunamis.

David Lannes //
David.Lannes@ens.fr

// FUNDING RESEARCH RESPONDING TO SOCIETAL CHALLENGES

Advances in science and technology are often closely interconnected with major social issues and are therefore often analysed in the light of their societal implications. A widespread expectation of scientific research is that it should help improve living conditions, therefore the ANR - through its choices of programmes has made it a priority to ensure that the possibilities offered by the best of science and technology are oriented towards the needs of society.

The ANR directly addresses a number of societal issues in programmes that intend to provide scientific and technological responses to burning societal questions, such as public health, civil security, social well-being.

These programmes stimulate research that is in line with major demands, in line with evolutions or lifestyle changes (increased life expectancy and development of age-related diseases, changes in lifestyles and consumer habits, emergence of infectious diseases, persistence of major pathologies that affect an aging population, continuous desire for well-being), and global concerns (need for security, understanding of and adaptation to social changes, etc.).

ELIANE

Examination of the Links
between physical Activity,
Nutrition and Environment

National programme on food
research 2007

PHYSICAL ENVIRONMENT AS FACILITATOR OR BARRIER TO A HEALTHY LIFESTYLE

ELIANE is a multidisciplinary project that aims at better understanding the relations between feeding habits and physical activity and the characteristics of the environment (social, physical). The built environment (urbanisation, facilities, transport infrastructure, etc.) and the proximity facilities and services (food stores, restaurants, leisure and sporting facilities, etc.) were put in relation with individual behavioural data. The project combines the tools of geography, spatial analysis (accessibility), epidemiology and sociology. The project has described new behaviour typologies (physical activity, sedentariness), identified certain social disparities of accessibility to sporting facilities, developed spatial analysis methods that have been applied to the food supply environment, and evidenced relations between the feeding environment and physical activity and excess weight in young persons, that differ according to socioeconomic status. These data should help implement public health nutrition policies aiming to adapt the consumers' environment to improve the capacity to make individual choices that are positive for health.

Jean-Michel Oppert //
jean-michel.oppert@psl.aphp.fr

// ALZHEIMER'S DISEASE & RELATED DISEASES PROGRAMME

Alzheimer's disease and related diseases represent a major societal public health issue due to the aging of the human population and the lengthening of average life expectancy. Their frequency and severity, as well as the disability and social exclusion they lead to, are a real challenge for patients, families and caregivers. This programme supports the research part of the National Alzheimer Plan 2008-2012 and aims particularly to produce new diagnostic tools and develop both drug and non-drug therapies that can block the evolution of the diseases or prevent them. It also aims to improve the comfort of patients and their friends and families at different stages of disease progression. The 2011 call had three objectives: to increase fundamental knowledge on these diseases; to promote interdisciplinary research and the convergence of basic, clinical and industrial research; to develop research projects using pre-existing and appropriate groups of patients/cohorts and biological resources.



// EUROPEAN PROGRAMME FOR RESEARCH ON RARE DISEASES

(ERA-NET E-RARE)

In Europe, a disease is defined as rare when it affects less than five people in ten thousand. The majority of rare diseases are genetic diseases, often serious and chronic, for which treatments and means of diagnosis are lacking. Although rare if considered individually, they represent a major public health problem. The fragmentation of resources and knowledge about these diseases, combined with the small number of patients affected by each disease, makes it necessary to collaborate at international level through multidisciplinary approaches with the aim of elucidating the subjacent molecular defects and the physiopathological mechanisms, establishing patient registers and

biobanks, identifying biomarkers, developing new diagnosis methods, and conducting clinical studies to develop treatments. This multilateral programme is funded by several European bodies and aims at speeding up the acquisition of knowledge that can contribute to the development of diagnostic aids and treatments for rare diseases, thanks to multidisciplinary and transnational collaborations.



GLYCONANOVECTOR

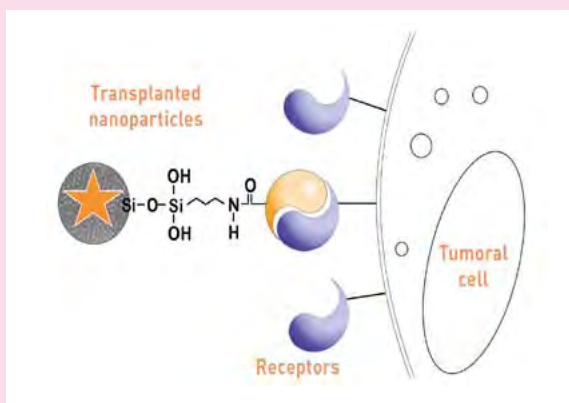
Glyconanovectors for the mono and biphotonic photodynamic therapy

PNANO programme 2007

NANO-OBJECTS FOR THE TARGETING, IMAGING AND TREATMENT OF CANCEROUS CELLS

More than 800,000 people in France have cancer, and each year 150,000 people die from it. Considerable research efforts are devoted to this illness, which has become a national priority. The GLYCONANOVECTOR project is part of an initiative whose

ultimate goal is to find treatments that are more effective and better suited to the patients, so as to reduce hospitalisation times and lower health costs for the society. Its aim was to synthesise nano-objects called theranostics, because they can not only specifically target the cancerous cells, but also produce the cell imagery and treat them. New photosensitisers have been synthesised and encapsulated in silicon nanoparticles which have themselves been modified by a coupling agent that enables them to recognise the tumoral cells and fix themselves on them. In vitro studies on breast cancer cells have shown that the photodynamic therapy kills a large percentage of these cells. In vivo tests conducted on mice with tumours have shown the effectiveness of nano-objects in the destruction of diseased cells and the reduction of tumours.



Jean-Olivier Durand //
durand@univ-montp2.fr

// CHANGING SOCIETIES PROGRAMME

The globalisation of economic and cultural exchanges, and the movements of goods and people, profoundly affect the structure of societies, their integration and differentiation mechanisms, and their modes of governance. The analysis of these changes requires not only an historical perspective, but also an analysis of the economic, political, cultural and social processes within the societies themselves, on the various scales - from the most individual to the most collective - at which they can be examined.

The "Changing Societies" programme, intended for the different disciplines of social science and the humanities, proposes to analyse these changes from three different viewpoints, namely 1) the inequalities: understanding the dynamics of production, structuring and perception of inequalities in the different fields of individual and collective life; 2) globalisation: analysing the different forms of globalisation, through historical and comparative approaches, studying the modes of production and dissemination of norms, modes of government and the international processes of circulation of public and collective modes of action, the economic regulators, the determinants of the production or transmission of know-how; 3) cultures: analysing the emergence and development of cultures and cultural phenomena through the study of man/ape differentiations and the evolution of human diversity, the emergence and development of systems (spoken language and languages, writing, etc.), the variability of cultures and their evolution dynamics.

MOVING TOWARDS THE DEVELOPMENT OF NEW TOOLS FOR DIAGNOSING MENINGITIS

HyperVirGBS

Role of the protein Gbs2018C in the hyper-virulence of clone ST-17 of group B streptococcus.

Infectious diseases and the environment (MIE) programme 2008

Researchers from the Cochin Institute, the Pasteur Institute and the INSERM have identified a protein on the surface of the Group B Streptococcus (GBS) that enables it to colonise and cross the hematoencephalic barrier that separates the circulating blood from the brain fluid. The bacterium can thus induce meningitis, the most serious form of infection in the new-born child. Through complementary approaches, in particular by experimentally reproducing the human neonatal infection, the researchers demonstrated that a specific surface protein of the clone responsible for virtually all cases of meningitis was the cause of its hyper-virulence. This protein, called HvgA, enables the streptococcus to adhere *in vitro* to the cells that constitute the hematoencephalic barrier. Furthermore, the discovery of this protein and its crucial role in the infection process could have major implications in the development of new diagnostic aids. This protein could thus constitute a vaccination target for the prevention of GBS meningitis.

Claire Poyart // claire.poyart@cch.aphp.fr



// CONCEPTS, SYSTEMS & TOOLS FOR GLOBAL SECURITY PROGRAMME

This programme aims to bring forth concrete solutions to questions of global safety, and in particular innovative solutions concerning the protection of citizens (fighting terrorism and serious crime, emergency and rescue services, forensic services), the protection of vital infrastructure and networks (transport, energy, information) and their interconnection (domino effects), security of frontiers and flows, both material and immaterial, crisis management, whatever its origin (malicious act, catastrophe of natural or accidental origin), during the phases of preparation, planning, response, through to repair. A prospective, innovative and structured approach to security requires effective linking of the upstream and downstream research, with the aim of delivering solutions that are both applied and applicable, from the aspects of ethics, system acceptability, privacy, and their practical and economic effectiveness. One of the keys to success of research into security lies in its multidisciplinary nature, given the extent to which the interdependence between the technologies, Man and modes of organisation govern the effectiveness of any security system.



IAAIS

Improved Active Imaging
for Surer Identification

Operational, scientific,
technological and legal study
for the design and use
of an active hand-held imaging
device for identifying suspects
under conditions
of poor visibility.
Concepts, Systems
and Tools for Global
Security programme
(CSOSG) 2008

ACTIVE IMAGING SERVING GLOBAL SECURITY

Active imaging (imaging with laser illumination and temporal aliasing) has the necessary capacities for producing a light “binocular” type of independent device, for high resolution imaging at distances of several tens of metres by night, through smoke, fog or veiling, with or without ambient lighting. The IAAIS project stands out by the combination of a technico-operational study and an exhaustive legal study. On the technological front, after analysing the applications with the public and civil protection services, the partners produced a high-performance active imaging demonstrator with laser safety controlled by design offering better image quality and smoke or fog penetration capacities than the state of the art, thanks in particular to an innovative diode laser source. The legal study enabled the applicable rules to be defined for both the new technology and the image produced by it, for use in the identification of persons. This “Privacy by Design” approach, combined with a study of the conditions of use of the “identifying image”, was published as a book.

Marc Bousquet //
marc.bousquet@sagem.com

MGLURPATHO

Group III metabotropic glutamate receptors (mGluRs): from new molecules to therapeutic development for the treatment of Parkinson's disease

ERA-NET NEURON programme 2008

THERAPEUTIC DEVELOPMENT IN PARKINSON'S DISEASE

Parkinson's disease affects 150,000 people in France. Parkinson's disease is characterized by degeneration of dopaminergic neurons of the substantia nigra, associated with hyperactivity of glutamatergic systems in the subcortical structures known as the basal ganglia. This hyperactivity may play a central role in the loss of dopaminergic neurons, the expression of parkinsonian symptoms (slowness of movement, rigidity and tremor) and abnormal movements (dyskinesias) associated with the chronic administration of L-DOPA, the reference treatment for Parkinson's disease. The discovery of pharmacological agents that may limit the action of glutamate by acting on G-protein coupled receptors or metabotropic glutamate (mGlu) receptors has opened

up a promising field of research in the treatment of neurodegenerative diseases. They are widely expressed in the basal ganglia where they can increase cellular excitability (group I) or modulate neurotransmitter release (groups II and III). This project takes advantage of the different specialties of four teams involved in the study of mGlu receptors from three European countries (France, Italy, Sweden). The expertise involved ranges from chemistry, pharmacology, immunohistochemistry, molecular biology and behaviour, in order to characterise the functions of mGlu receptors in animal models of Parkinson's disease. The team of chemists (partner 1, F. Acher), in collaboration with J.-P. Pin (IGF, Montpellier), has discovered novel ligands of Group III mGluRs (such as LSP4-2022, see figure) by rational design and virtual screening. They thus characterised the pharmacological properties of several compounds on cloned mGlu receptors. At the functional level, partners 1 and 4 (M. Amalric and G. Fisone) have demonstrated the beneficial effect of some of these ligands on Parkinsonian motor symptoms and dyskinesia induced by chronic L-DOPA treatment in rodent models of the disease. In parallel, the partner 3 (F. Nicoletti) demonstrated the neuroprotective action of these ligands on dopaminergic neurons before symptoms of Parkinson's disease appear. This multidisciplinary project will have major implications in the neuroprotective and palliative treatment of Parkinson's disease through the metabotropic glutamate receptors.

Marianne Amalric //
Marianne.amalric@univ-amu.fr



// INNOVATIVE SOCIETIES PROGRAMME

The joint occurrence of an economic crisis, a financial crisis and an environmental crisis creates an unprecedented and singular context to which societies must inevitably adapt. This adaptation notably implies rapid adjustment to global competitiveness, an improvement in the productivity and quality of a large number of service activities, adaptation to demographic aging, and a technical revolution to strongly limit the environmental externalities. This will be done by the rapid introduction of technological and social innovations that will be accepted or refused by society to varying extents. These innovations are indeed likely to bring considerable changes to lifestyles and economic models. The technological innovations concern all areas of scientific life, working life, and day-to-day living. The major challenge for the generations of to-

day and tomorrow will be to reconcile quality of life with the constraints of environmental preservation, economic sustainability and access to resources. The programme is intended to enlighten the way the present times can be understood and to explore avenues that hold promise for the future. The challenge is to understand what - in a perspective of crisis recovery - an innovative society could be. This programme focuses on the interactions between innovation and society, and notably on the analysis of the modes of appropriation or refusal of innovations by individuals or social groups, on the understanding of consumption behaviour in the face of new products and services, on the assessment of the influence of innovation on practices, values, and lifestyle choices. It is a question of practising systematic interdisciplinarity between laboratories and companies in various thematic areas (Information Communication Sciences and Technologies, nanotechnologies, materials, energy, transport, habitat, environment, agricultural and food production, industrial processes, health, etc.) and the social sciences and humanities (sociology, economy, history, geography, psychology, etc.) that take an interest in individual and social behaviour and economic models.

FRISKREG

Risk, Uncertainty and Regulation:
A Comparison between France
and Germany in the Field of Food
Safety and Nutrition

Franco-German programme
in SSH 2007



A COMPARISON BETWEEN FRANCE AND GERMANY IN THE FIELD OF FOOD SAFETY AND NUTRITION

This Franco-German project concerned the behaviour of consumers according to their nationality. It studied the reactions of French and German consumers when provided with information on the risks of nanotechnologies when purchasing food products called "nanofoods". If the interest in the products decreases in both countries as the subjects (consumers) become better informed, there are differences in the interest paid to the content or the packaging. Furthermore, the reaction is all the more negative when it is linked to the product characteristic favoured by the subjects. It is in fact these initial representations that have the most influence on the behaviour of the subjects. Other results suggest that: 1) the attitude of the German and French populations to nanofoods is negative on the whole (unlike the American population); 2) believing in a God has no influence on the perceptions of German and French consumers, but the perceptions do remain correlated with their moral values; 3) the health criterion overrides all the other criteria in both countries; 4) the development of such products is rendered improbable due to the cost of demonstrating their harmlessness. For the public policies, the project confirms that providing information is potentially unlikely to overturn behaviours, which are more broadly determined by the consumers' conceptions with regard to science, technology and nature. The role of consumer confidence in government organisations is also crucial. It is therefore more important to increase confidence in this area than to provide one-way streams of information. The project also suggests that consumer attitudes remain sufficiently marked by their nationality to prevent a European agency acting alone from having a significant impact on their perceptions in the near term. Lastly, work on the implications for health should take priority over the other implications.

Sandrine Blanchemanche //
Sandrine.Blanchemanche@paris.inra.fr

// SUPPORTING RESEARCH ENDEAVOURS RESPONDING TO ECONOMIC & COMPETITIVENESS CHALLENGES

Scientific and technological breakthroughs play a key role in terms of modernisation or economic growth and gains in productivity in developed and emerging countries. This is especially the case for rapidly growing or evolving fields such as biotechnologies, nanotechnologies, and Information Communication Sciences and Technologies. The ANR supports research in all fields representing a driving force for productivity, employment and competitiveness and having a real leverage effect in terms of technological and industrial development, patenting, start-ups and SME creation. For those fields, the partnerships between industry and public research ensure the relevance of the research results for the private sector and the transfer of knowledge.

// MATERIALS & PROCESSES FOR HIGH PERFORMANCE PRODUCTS PROGRAMME

The aim of this programme is the development and analysis of materials and associated processing, leading to high performance products fulfilling the needs of modern society (health, security, comfort) whilst addressing the constraints of sustainability (materials efficiency, energy production and savings, recycling, global warming, etc.). The programme stresses the need for systematic life cycle analysis. Improving both materials and processing in order to obtain higher performance also falls within the scope of the programme. This programme also aims at fostering knowledge transfer between academia and industry and to help innovative SME's in this field. Improved understanding of materials and their processing should strongly contribute to an increase in their competitiveness.



INNOVATIVE METHODOLOGY FOR THE DESIGN AND INTEGRATION OF AN IN-VEHICLE DIAGNOSTIC SYSTEM

0-DEFECT

On-Vehicle Aid for AUTomobile Wiring Harness Diagnostics - In-situ detection of defect location (e.g. poor contacts) in hardwired electrical networks in automotive vehicles

Land transport vehicles programme 2008



▲ Illustration of the electrical network of an automotive vehicle
Credits: Delphi

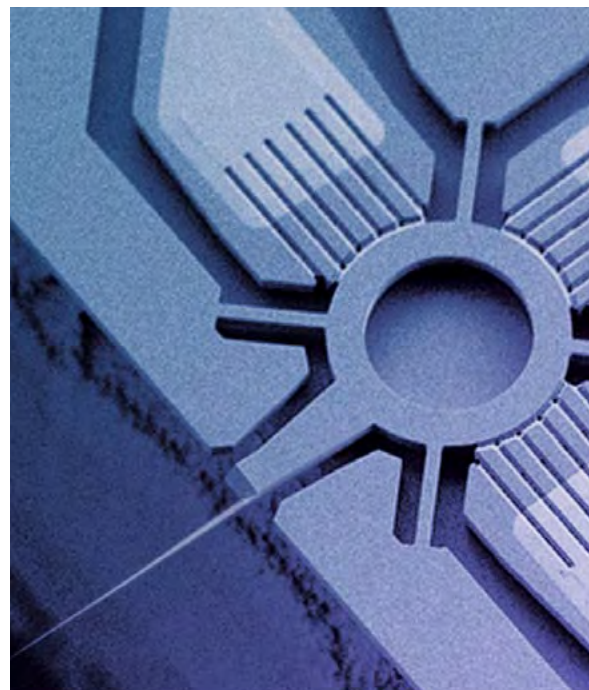
The cumulative length of the cables installed in a modern automobile totals nearly 4 km, but at present there is no effective monitoring system to detect their failures. The aim of 0-DEFECT is to study and test a technology for detecting, characterising and locating wiring defects that can be mounted in road transport vehicles. An innovative methodology that has no adverse effects on EMC (electromagnetic compatibility) functioning and constraints, has allowed the design and integration of a diagnostic system in a vehicle. A diagnostic board that can monitor 4 different cables was integrated in one of the electronic control units (ECU) of a Peugeot 3008 in order to evaluate its performance as realistically as possible. Measurements shall also be taken in an anechoic chamber in the near future. These methodologies are currently being applied to aeronautics and the research work to improve performance and allow the detection of soft faults (wear of insulant, corrosion) is continuing.

Fabrice Auzanneau //
fabrice.auzanneau@cea.fr

// NANO- TECHNOLOGIES & NANOSYSTEMS PROGRAMME

The Nanosciences and Nanotechnologies are characterised by a scale of length: the nanometre. They concern all the topical disciplines, whether they address objects or a structuring of objects of dimensions less than 100 nm. They thus represent points of scientific convergence between disciplines. They are also perceived as being likely to modify conventional industries in many sectors (communication, energy, health and the environment) and to bring out new application areas resulting from technological integration. Mastery of nanotechnologies and nanosystems is therefore the key to progress in many domains, in particular with more efficient use of the resources at our disposal. This is why they are developing very rapidly and attracting major investments from many countries through their R&D programmes. The programme has several objectives. Firstly to create skills, concepts, instruments and methods that subtend the development of nanotechnologies. Secondly to demonstrate nanodevices and nanosystems that deliver new functions. And lastly, to reinforce the strategic position of France in the areas where it is best positioned to integrate nanotechnologies in future products intended for the major sectors listed above while at the

same time satisfying the implications of responsible management of natural resources, quality of life and health. The programme must also promote the emergence of new approaches and the joint production of knowledge and know-how between academic and industrial researchers to speed up the integration of this knowledge in dynamic currents of innovation that will allow an improvement in employment in a context of growing global competition.



FOCUS

MADSPAM 2.0
Automatic Methods for Detecting
SPAMdexing on the Large
Information Networks

Software technologies
programme 2007



AUTOMATIC SPAM FIGHTING METHODS

Pollution of content by spam in open environments like the Web, forums, blogs and all collaborative sites is increasing at great speed, and today is attacking all Web media. The use of spam on the WWW is referred to as "spamdexing". It contributes to the decline of many search engines. All Web 2.0 players are directly threatened by the generalisation and growth of the various spamdexing phenomena. Pollution of the Web has become so rife that all the commercial search engines today have to devote a large part of their resources to fighting spam. Whereas numerous measures have been taken to fight e-mail spam (90% of e-mail traffic), very little has been done for any of the forms of spamdexing addressed in MADSPAM 2.0. The purpose of MADSPAM 2.0 is to develop automatic methods of detecting spamdexing along with tools for countering it in its various forms, and deploying them on a large scale in true situations. The project has given rise to software components integrated in commercial products, significantly improving the identification and exclusion of spams: 100,000 spams processed per day on sites dedicated to blogs, for example.

Tanguy Urvoy //
Tanguy.Urvoy@orange-ftgroup.com

F@CIL

Fast Contactless Intuitive Layers

TELECOM programme 2007

INCREASE THE DATA RATE CAPACITIES OF CONTACTLESS APPLICATIONS TENFOLD



The F@CIL project has multiplied by ten the data rate capacities of contactless cards, achieving a data rate of 6Mb/s, that is to say 7 times faster than current rates, while maintaining the possibility of remotely supplying the remote object via the magnetic field produced. Applications for transferring MP3 music or even image files, health applications, identity applications, and many others that require wireless broadband transfers are thus now within technological reach. Several patents have been registered, and the project won the SESAME 2009 prize, Hardware category, at the printed circuit board trade fair.

Jean-Paul Caruana //

jean-paul.caruana@gemalto.com

FOCUS

// BIOMEDICAL INNOVATION IN PARTNERSHIP WITH INDUSTRY PROGRAMME

The aim of this programme is to finance partnership research projects in order to exploit the results of biological sciences and cutting edge technologies in the field of health: 1) to support and reinforce the scientific and industrial communities (biotechnologies for health, pharmaceuticals, cosmetics, etc.) more particularly in the areas of inflammation, stem cells and RNA, 2) to encourage translational research into common and rare diseases, 3) to develop new therapeutic approaches (medicines, biological products, etc.), galenic innovations and new vaccines, 4) to develop new diagnostic approaches with, in particular, the validation of biological markers used for prognostic, diagnostic and therapeutic purposes, 5) to develop new aids to facilitate, speed up, improve and thereby increase the effectiveness and productivity of biomedical research (in silico, cellular and animal models, production of biomolecules, etc.).



// EUROPEAN PROGRAMME ON LONG-TERM CHALLENGES IN INFORMATION & COMMUNICATION SCIENCES AND TECHNOLOGIES

(ERA-NET CHIST-ERA)

CHIST-ERA is an ERA-Net of the FET (Future and Emerging Technologies) programme of the 7th Framework Programme for Research. Its overall objectives are to develop the coordination and cooperation of research funding agencies in Europe on emerging and promising subjects in the field of information and communication sciences. The ANR is the coordinator of CHIST-ERA, which today groups 9 countries. Each year the programme launches a call for proposals on two different hot topics considered to be priorities.

The call topics have a common characteristic, namely that they lead to highly innovative, multidisciplinary collaborative projects, and have significant potential for having a scientific and technical impact. They are expected to result in major technological developments that will have an impact on high power computing, information management, the change of scale of information systems, interconnections, system reliability requirements, interaction between humans and these systems.



FOCUS

TELEMACH

Teleoperated maintenance for
tunnel boring machine
cutter-head tools

Interactive systems and robotics
programme 2007

TELEOPERATED ROBOTIC TOOLS USED IN MAINTENANCE OPERATIONS, A SECTOR AS YET POORLY AUTOMATED

The TELEMACH project concerned the development of teleoperated and generic robotic tools that would replace humans in maintenance operations, particularly tool changeover. The main difficulties relate to the operating conditions: high pressure (several bars), confined environment filled with mud. The essential elements of the study concern three complementary research subjects: 1) the mechanical architecture of a teleoperated arm deployed in a confined environment from a booth protected from the excavated materials, 2) operator-robot coordination, and 3) the performance of elementary tasks. The value created by the project is very high in terms of patents and software applications in a sector that is still poorly automated.

Michel de Broissia //
M.DEBROISSIA@bouygues-construction.com

INNOVATIONS IN FOUNDRY WORK

CRACRACKS

Concerted research for analysis
of crack phenomena during solidification
of steel

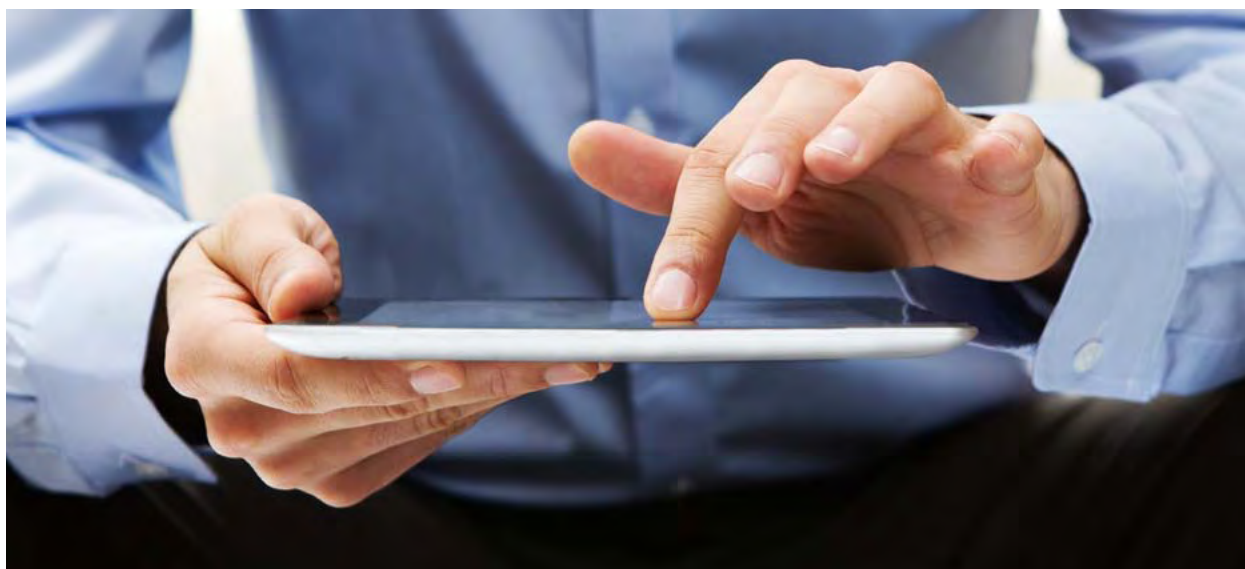
Mat&Pro programme 2007

The phenomenon of hot cracking seriously affects certain steel castings or iron and steel products such as continuously cast ingots or billets. This defect consists in a tearing of the metal when it is almost completely solidified. As it contains only a very little liquid in the form of films between the crystals, it tears easily under the internal stresses resulting from the temperature variations. Avoiding these tears – or cracks – has strong industrial implications in terms of quality (reduce the reject rate) and production of new grades of steel (the crack sensitivity of very high strength steels limits continuous casting speeds). The CRACRACKS project proposes new technological solutions to better predict these defects and thereby permit optimised control of the industrial solidification processes. Original techniques based on the contactless laser speckle extensometer have been developed to characterise the rheological behaviour of the steels at very high temperature. A numerical simulation approach on the scale of a volume representative of the metal at the end of solidification is operational.

Michel Bellet //
Michel.Bellet@mines-paristech.fr

// HARDWARE & SOFTWARE INFRASTRUCTURES FOR THE DIGITAL SOCIETY PROGRAMME

The economic and social activity of developed countries is already crucially dependent on digital infrastructures. These infrastructures, like the Internet and the World Wide Web (WWW) are also the source of new economic developments, in the form of new services, whether commercial or not. Control of the design and development of these infrastructures is a major economic issue, notably because of the effects of scale and their generative nature. These infrastructures play a key role in the development of company competitiveness and scaling up for the new citizen-centric digital services. The programme covers all the research work aiming to produce hardware and software infrastructures that make available ubiquitous communication, storage and computation resources. These infrastructures are very widely distributed on highly diverse scales (multi-scale), ranging from embedded equipment items (sensors, micro and nano-controllers, etc.) to massively parallel and heterogeneous architectures (multi-core) and machine grids on the scale of the Internet.



// ENCOURAGING RESEARCH ADDRESSING ENVIRONMENTAL ISSUES & GREEN TECHNOLOGIES

The ANR gives high priority to the issues raised by the “Grenelle de l’Environnement” (French National Environment Round Table) with the result that the Agency is now a major actor in funding environment-oriented research projects. The ANR programme planning fits into a trend where the European and world energy and environmental policies are dominated by the question of global change. Investment in low-carbon, low-pollution technologies, that make efficient use of raw materials, has become one of the major instruments to encourage new processes of economic growth and adapt our societies to the on-going changes. It is necessary to create and develop new modes of industrial production, urban organisation and transport that use alternative, renewable energy sources and massively reduce greenhouse gas and pollutant emissions. It is also necessary to better monitor the quality of the environment and how it evolves. On a more academic footing, global change is becoming a scientific problem in its own right, and it is necessary to develop tools and models to understand the interconnections between the large natural and anthropogenic systems. The ANR promotes innovative research approaches, whether integrated or cross-disciplinary, to contribute to sustainable development.

// VIABILITY & ADAPTATION OF PRODUCTIVE ECOSYSTEMS, TERRITORIES & RESOURCES IN THE FACE OF GLOBAL CHANGES PROGRAMME

The biosphere is going to face major changes in the coming decades. Agriculture and, more broadly, the territories and all ecosystems used by societies, will have to adapt to them. These changes will be environmental, economic and social.

The Agrobiosphere programme aims at defining the transitions towards sustainable productive systems that are suited to this new context. It relies upon a

better understanding of the ecological functioning of the productive systems. It aims at widening the range of technological, economic and social solutions that can be used to solve the problems of viability and adaptation of the productive ecosystems to the "global changes". More generally, it aims at supporting the design and implementation of paths for the adaptation of the productive systems and territories.



SYMBIOSE

Study and optimisation
of Microalgae/Anaerobic Bacteria
Coupling for the Biological
Production of Energy from primary
biomass and organic waste

Bioenergies programme 2008

COUPLING THE CULTURE OF MICROALGAE AND ANAEROBIC DIGESTION TO PRODUCE ENERGY

While interest in the culture of microalgae for producing biofuels - liquid (bio-oils) or gaseous (H₂) - is constantly growing, the future of these cultures remains a point that needs to be better evaluated. The SYMBIOSE project proposes to study jointly the algal production associated with anaerobic digestion for the production of energy. This association is observed in the natural environment and in lagooning effluent treatment systems. The aim of this project was to study the implications of this coupling to find a solution to environmental and industrial energy issues. Biomethane is thus produced by an anaerobic digestion process that ensures the codigestion of an organic residue with the algal biomass; the resulting mineralised nutritive elements are recycled in the growing of microalgae. This project has allowed the development of a pilot system coupling the growing of phytoplanktonic biomass and anaerobic digestion on the preindustrial scale (culture pond of 60 m² and digester of 1 m³). Two patents and 12 publications have resulted from this project.



▲ The "Algotron" process combining the culture of microalgae and an anaerobic digester based at the LBE (Biotechnology and Environment Laboratory) and designed as part of the Symbiose project
Credits: SYMBIOSE BIOE-2008 Project - B. Sialve

Bruno Sialve //
bruno.sialve@naskeo.com

FOCUS

MAJOR BREAKTHROUGH IN THE UNDERSTANDING OF EARTHQUAKES AND THEIR EFFECTS:

the example of the North
Anatolian Fault

SUPNAF

Links between the complexity of the fault, seismic swarming and speed of rupture: the importance of the study of the North Anatolian Fault

Natural hazards programme 2008

Are there two types of fault: one with a simple structure displaying little seismicity other than in the vicinity of the nucleation zone, and another with a complex structure displaying many aftershocks and sub-Rayleigh rupture propagation? That is the problem that this project set out to address, taking the western part of the North Anatolian fault as the subject of the study. Two very major events occurred there in 1999, providing absolutely unique sets of data. The main implications for this area are considerable since the city of Istanbul is particularly threatened. The exceptional data collected since the 1999 crisis have enabled this project to further the understanding of earthquakes and their effects. One of the major results is the evidencing, for the first time, of a phase of preparation lasting almost one hour prior to the severe Izmit earthquake. The observed signal comes from a very small earthquake which recurred at least 18 times and perhaps up to 40 times during the 44 minutes preceding the main event. It took place at the exact point where the major earthquake started, while remaining much smaller.

Jean Schmittbuhl //
Jean.Schmittbuhl@unistra.fr

// CONTAMINANTS & ENVIRONNEMENTS PROGRAMME

The globalisation of exchanges, climate change and the accelerated production of xenobiotics and new synthetic compounds increase the risks of environmental contamination, potentially harmful for ecosystems and human health. The increasing use of biological and chemical molecules or physical agents (such as electromagnetic waves or magnetic fields) require in-depth knowledge of fundamental aspects of their dynamics in the environment (distribution, accumulation, transformation and biotransformation, and the effects of climate changes) and makes it necessary to improve methods of detecting them and monitoring their transformation in the environment, and better assessing their use - often at low concentrations - and their impact on ecosystems and human and animal health. The programme aims at improving knowledge of contaminants, their cycles and transfer between ecosystem compartments, and their effects on ecosystems and health.



CHLORDEXCO

Soil and water pollution by chlordecone in the French West Indies, consequences on the contamination of crops and freshwater organisms

Contaminants, Ecosystems & Health programme 2008

RESEARCH INTO THE ENVIRONMENTAL CONSEQUENCES OF AN INSECTICIDE IN THE FRENCH WEST INDIES

Chlordecone, a persistent organochlorine insecticide, was used on banana crops in the French West Indies between 1972 and 1993, contaminating soil, water, plants and animals. Scientific bases for managing the consequences of this pollution are lacking. Thus, it is not known to what extent the plants grown in contaminated soil will themselves be contaminated, nor the alterations suffered by the organisms (crustaceans and fish) that live in the contaminated ecosystems. This project has shown that in the labora-

tory, a slow and unexpected degradation of freshly applied chlordecone is observed, whereas 70 to 80% of the stock of chlordecone in the soil remains potentially available for entrainment by leaching. This results in the contamination of rivers, chiefly through underground supplies. The average concentrations in the water remain low (less than 1 µg/l) but sufficient for a high bioaccumulation of chlordecone to be observed in a crustacean (*Macrobrachium faustinum*) with potential risks of transfer: human toxicity by consumption of contaminated shrimps. In plants, the degree of contamination of the organs depends on their position in the raw sap flow that carries the chlordecone. The following diagram can guide the choice of species to cultivate in contaminated soils.

Philippe Cattan // philippe.cattan@cirad.fr

// GLOBAL ENVIRONMENTAL CHANGES & SOCIETIES PROGRAMME

It is now critical to take into account the various changes in the environment, climate, biodiversity, quality of air, water and soils, for the development of human activities (types of development, demographic progress, globalisation of exchanges, technological changes and social behaviours). These issues now largely exceed the local scale and require an understanding of the interactions on the regional and global scales, hence the term planetary environmental changes. The complex question of the adaptation of societies to changes is posed. It necessitates a new approach interconnecting the different systemic components, extending from the fluid, living and solid Earth to the societal and technological worlds. Exceeding the capacities of a scientific community or a nation, this requires a resolutely interdisciplinary and international approach. This programme is dedicated to integrated approaches in Earth System Sciences working towards sustainable development, interconnecting research into the environmental changes and research into the development of human societies, with particular attention devoted to the regional and global scales.



VALERIE

Valorisation of immediately usable energy resources by the building shell

Smart Buildings and Solar Photovoltaic programme 2008

ENERGETIC EFFICIENCY OF BUILDINGS – BIOCLIMATIC DESIGN REVIEWED BY MODELLING

The conventional practice to ensure energy efficiency in a building consists in insulating it from the external environment in order to limit its exchanges with the exterior, and therefore reduce its energy consumption. However, this environment can provide energy sources even in cold weather, and heat sinks even in hot weather. The project proposed reviewing this perspective by considering the external environment as an energy resource which, rather than systematically isolating buildings from it, must, on the contrary, be better used. The project enabled the extent of this potential to be quantified, by examining in particular the temporal coincidence between the energy needs and resources (solar potential, celestial vault, etc.) and establishing models to define new families of technical solutions (envelope components, etc.) and design choices combining insulation and maximum use of the environment's energy potential.

Thierry Duforestel // Thierry.duforestel@edf.fr

// SUSTAINABLE PRODUCTION & ENVIRONMENTAL TECHNOLOGIES PROGRAMME

The ECOTECH programme is a generic research programme that aims at stepping up French research into ecotechnologies, developing innovation in the environmental industries and significantly reducing the environmental impact of industrial activities. The programme focuses on the development of technologies, instruments and services for developing innovation in sustainable industrial production and in the environmental industries. It aims at increasing national research into the environmental improvement of industrial processes, particularly in terms of reduction of greenhouse gas emissions, volumes of waste and effluents produced, consumption of resources and raw materials, and the substitution of polluting substances. It aims to encourage disruptive technologies to promote the competitiveness of the environmental industries in treating pollution, and measuring environmental quality, in particular by encouraging the transfer of technologies resulting from information technologies, nanotechnologies and biotechnologies.



// SUSTAINABLE ELECTRICITY PRODUCTION & MANAGEMENT PROGRAMME

The aim of this programme is to promote disruptive research into the production, storage and management of electricity. It covers the questions of renewable production of electricity (mainly from solar photovoltaic), of production of hydrogen from water electrolysis and its use in fuel cells, of electrochemical storage, of local electricity management and smart grids. Its objective is to intensify the development of renewable energies and the integration of innovative systems allowing optimised electricity storage and management, particularly in the sectors of transport and buildings.



CONCIGI_HT
Compact AC-DC Converter with Integrated High Voltage Galvanic Insulation: Improving the energy efficiency of current conversion systems for railway motor coaches by integrating power electronics technologies

Land transport programme 2008



▲ Schematic diagram of the converter developed under the CONCIGI_HT project
Credits: ALSTOM

OPTIMISING THE ENERGY EFFICIENCY OF RAIL TRANSPORT

Railway motor coaches today draw electrical energy from the high-voltage catenaries by means of a step-down transformer allowing AC-DC conversion. The transformer is therefore a key part of the motor coach energy conversion system. Owing to the high voltage operating constraints, it is a heavy and voluminous piece of equipment. The aim of this project was therefore to substantially reduce the volume and weight of the step-down transformer, thereby significantly optimising the energy efficiency of rail transport. The work carried out aimed at taking up numerous challenges relating to power electronics in high voltage applications. The results obtained will allow, by the end of 2012, the production of a preindustrial prototype of an elementary block that will allow weight savings of up to 35% while at the same time increasing energy efficiency by about 3.5%.

Philippe Ladoux // philippe.ladoux@laplace.enseeiht.fr

FOCUS

// SUSTAINABLE CITIES & BUILDINGS PROGRAMME

The global urban population is growing constantly, and the 21st century is turning out to be the century of cities, which are not only engines of growth and wealth creation but also generators of instability, social inequality and concentrations of environmental nuisance. The "Sustainable cities and buildings" programme is centred on the sustainability of daily urban life, ranging in scale from the building to the urban area, in a context of substantial and uncertain structural change (phenomena of metropolisation, increasing scarcity of certain natural resources, requirements to save energy, preserve the environment and limit the impact of urban and construction activities, adaptation to climatic change and demographic developments, etc.). It is a question of reinforcing the research dynamics around shared challenges – energy efficiency, minimising environmental nuisance, improving the living environment, etc. – and similar approaches – role of modelling and measurement in understanding phenomena, design of "solutions", "systems" approaches, by allowing work on different spatial scales and at the interface between these scales.

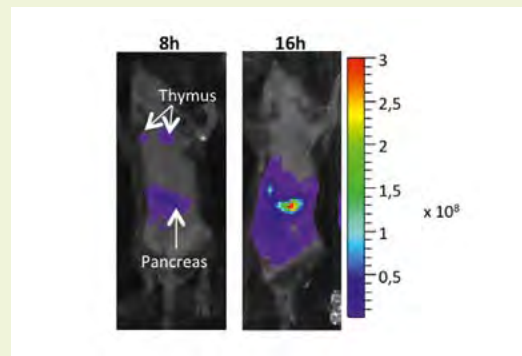


PREVENTIVE AND THERAPEUTIC ADVANCES AGAINST THE RIFT VALLEY FEVER VIRUS IN EAST AFRICA

RESISTFEVER

Identification of genes controlling resistance to Rift Valley fever in domestic mammals

GENANIMAL programme 2007



▲ Identification of the replication sites of the Rift Valley fever virus expressing the luciferase gene of *Renilla reniformis* by real-time imaging on the mouse (from Gommel et al, PLOS 2011)

The Rift Valley fever virus (RVFR), which can infect both humans and animals, is spreading from several East African countries. This virus causes serious epidemics that necessitate placing in quarantine, and is responsible for heavy economic losses in livestock rearing farms. At present there is no effective antiviral treatment or vaccine. The objective of RESISTFEVER was to test the hypothesis of a genetic origin of variability in sensitivity to the illness and the severity of its impact. An original collection of several subspecies of mouse (of the *Mus* genus) was used to locate the genes of resistance to the virus in a controlled environment and study their effects in different genetic pools. The results showed that the variability of infections due to the Rift Valley fever virus was effectively of genetic origin. Three chromosome regions and several candidate genes (including the *Oasl2* gene) were identified, enabling preventive and therapeutic applications to be envisaged. A patent for the use of the protein OASL as a drug against the virus and marker of genetic sensitivity has been registered at the US Patents Office.

Jean-Jacques Panthier // panthier@pasteur.fr

// INTENSIFYING PARTNERSHIPS BETWEEN ACADEMIA & INDUSTRY

One of the ANR's major objectives is to intensify research partnerships between public institutions and French companies.

The aim of ANR is to stimulate collaborative research and speed up technology transfer and the creation of economic value from the products of public research, by creating conditions that foster greater communication between public and private research. To meet these challenges, ANR has put in place - in addition to its targeted and bottom-up collaborative calls for proposals - specific instruments in the form of programmes (Carnot, Emergence, Industrial Chairs) and activities (a notable example being supporting the activity of the competitiveness clusters).

// EMERGENCE

EMERGENCE OF PRODUCTS, TECHNOLOGIES AND SERVICES WITH HIGH VALUE CREATION POTENTIAL PROGRAMME

The main objective of this programme is to promote the enhancing of the results of public research by financing "proof of academic concept" in laboratories, in order to achieve the effective creation of value from the work at the end of its financing. Emergence thus

supports developments (products, technologies, services, systems, processes, etc.) and complementary studies that aim at consolidating proof of concept and the protection of intellectual and industrial property. These consolidations are vital to facilitate the creation of value from the discoveries and inventions resulting from research, by enabling them to lead to innovations that are brought to market through transfer to an industrial partner, or by the creation of an enterprise at a stage that is attractive for investors. This programme, which was initially limited to the domains of biotechnologies and health technologies, has been open since 2010 to all scientific disciplines.



// INDUSTRIAL CHAIRS

The programme aims at accompanying research projects jointly led by public research institutions and enterprises. It encourages the integration of eminent French (expatriated or not) or foreign professors into higher education and research institutions, or research organisations, and reinforcing the best initiatives developed in French higher education and research. The programme implies establishing a strong and lasting partnership between the research institution and enterprises in a high priority and strategic area for the parties concerned. The aim is to provide more effective support to industrial research in all areas. The industrial chairs' objective is firstly to perform fundamental and applied research, and secondly to ensure training through high-level research.

// THE CARNOT PROGRAMME



Since 2006, the Ministry of Higher Education and Research has awarded the Carnot label to public institutes (the Carnot Institutes) that undertake to place partnership research at the centre of their research strategy. The Carnot Institutes encourage closer relations between public research entities and the industrial world, with the notable aim of achieving smoother and faster transitions from research to innovation and the transfer of technologies.

The ANR has managed the programme on behalf of the Ministry of Research since it was launched in 2006. Three calls for candidacies were open in 2006, 2007 and 2011. The ANR also monitors the labelled Carnot institutes. To accompany and support the bringing together of institutes and industrial actors, the ANR pays the Carnot institutes an annual additional sum calculated according to the partnership revenues. For the year 2011, an additional sum of more than € 58.5 million was devoted to the institutes.

✓ KEY CARNOT FIGURES FOR 2011



✓ THE INTER CARNOT-FRAUNHOFER PROGRAMME (PICF): AN INSTRUMENT FOR FRANCO-GERMAN COLLABORATION

This programme embodies the bringing together of Germany and France around a common instrument for the development of partnership research. The PICF programme is financed jointly by the BMBF and the ANR over the 2009-2011 period. Its aim is to establish collaborative research and innovative Franco-German projects between the Carnot institutes and the Fraunhofer institutes. In 2011, 28 projects were received, involving 31 Fraunhofer institutes and 18 Carnot institutes, addressing the themes of energy (25%), the environment (20%), health (11%), civil protection (7%), information and communication technologies (25%) and transport (1%). Seven projects were funded.

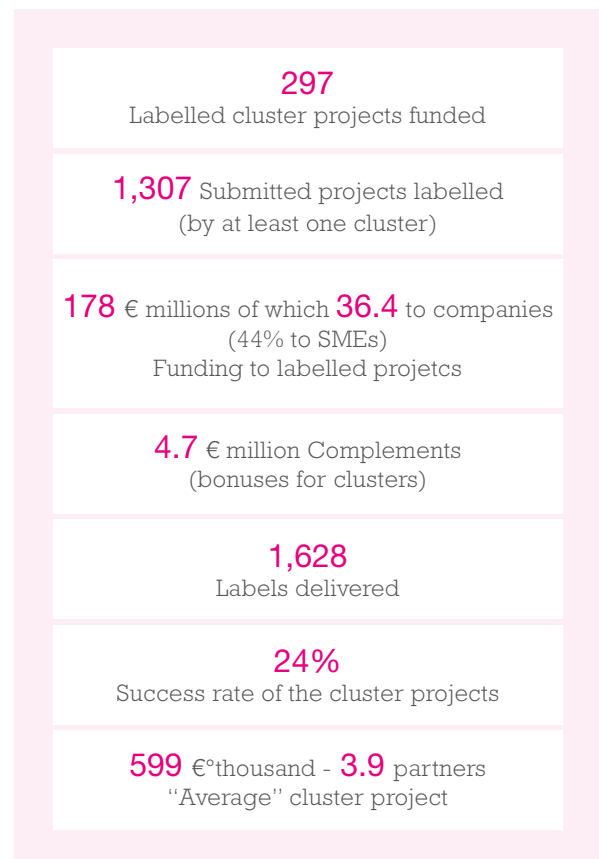


// COMPETITIVENESS CLUSTERS

A competitiveness cluster brings together companies, research laboratories and educational institutes in a given geographical location. These entities have committed themselves to a partnership approach that is intended to create synergies around innovative joint projects.

The ANR and the competitiveness clusters have three shared objectives: to reinforce the links between the public and private research players, to create value from the research, and to build scientific communities that gain national and international recognition. Since 2005 the ANR has implemented an incentive policy for competitiveness clusters through the recognition of the cluster label in the project selection process and the bonuses in aids to labelled projects.

✓ KEY FIGURES FOR COMPETITIVENESS CLUSTERS 2011



// ANR & ENTREPRISES

PUBLIC-PRIVATE PARTNERSHIP PROJECTS FUNDED BY THE ANR IN 2011

20% of the projects supported by the ANR are partnership projects between research organisations and companies. Due to the fact that the average grant awarded to these projects is higher than that granted to projects between public research organisations,

34% of the ANR funding was devoted to public-private partnership projects.

9% of all the ANR grants in 2011 were attributed to companies.

The ANR carries out financial analyses to validate the capacity of the beneficiaries to finance their participation in the projects.

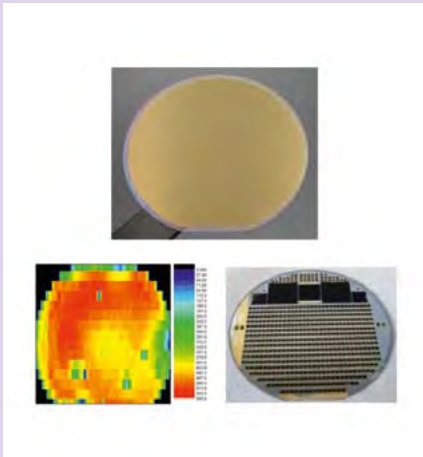
These analyses confirm the capacity of the ANR to accompany the companies in their R&D projects whatever the level of their revenues. About 25% of the beneficiaries in the enterprise category have annual sales totalling less than € 100 thousand, while 15% of them have no sales revenue and are still building their commercial offering.

FOCUS

SOLARBOND

Development of high efficiency multi-junction solar cells on reclaimable substrates

PICF Programme 2009



▲ In SolarBond, a new Ge-based substrate for the growth of III-V compound semiconductors was developed (above). This engineered substrate integrates a lift-off layer which allows easy removal of the solar cell layers after the epitaxy growth. The high quality of crystal growth on the engineered substrates was demonstrated by GaInP double-heterostructures showing photoluminescence intensities comparable to the growth on bulk Ge (left). Concentrator solar cells were grown on these substrates, lifted and transferred to a new carrier. Functional devices were demonstrated (right).

THE NEXT GENERATION OF HIGH-EFFICIENCY PHOTOVOLTAICS

Concentrator Photovoltaic Systems based on III-V multi-junction solar cells are achieving today's highest efficiencies for sunlight-to-electricity conversion. This technology offers great potential for power plants in arid regions of the world. Solar cell efficiencies exceeding 40% have been reported for conventional devices based on Germanium. Reducing the cost of these high-efficiency solar cells and further increasing their conversion efficiency is of strategic importance to make this technology cost competitive with conventional energy sources. The Fraunhofer-Carnot SolarBond project investigated - for the first time - an efficient industrial process for the fabrication of multi-junction solar cells on a reusable substrate. Conventional Ge wafers account for 25% of the overall solar cell cost and recycling of these scarce materials can lead to significant cost reductions. In SolarBond, a new engineered substrate was developed which serves as a template for the III-V crystal growth. With this template, all the requirements needed to replace the conventional bulk Ge or GaAs wafer can be met, i.e. high crystal quality and compatibility with high temperature epitaxy processes. The 8-10 µm thin solar cell structures can be removed from the engineered substrate for subsequent integration into a final carrier substrate. This work is being accomplished using proprietary core technologies of SOITEC in the field of engineered substrates (Smart Cut™) and debonding technologies. This new technology can lead to a breakthrough in high efficiency solar cell processing with a future significant reduction in production costs.

Franck Dimroth
frank.dimroth@ise.fraunhofer.de //
Yann Bogumilowicz
Boguyann.bogumilowicz@cea.fr

// DISSEMINATING KNOWLEDGE



// 50 SYMPOSIA & CONFERENCES

The ANR organises workshops and symposia informing the scientific communities - along with a wider audience - of its programme planning activities, future calls for proposals and the results of the projects funded.

In 2011, many symposia to discuss the progress of projects funded under the various bottom-up and targeted top-down programmes were organised throughout France.



THE ANR GRAND BIOLOGY-HEALTH SYMPOSIUM,

5, 6 AND 7 JULY IN LYON

Attended by nearly 450 participants, this symposium provided the stage for the oral presentation and discussion of the results of more than 100 projects funded under the 2006 and 2007 editions of the Blanc, Young Researchers, Emergence Bio, Longevity and Aging, Rare Diseases, Microbiology, Immunology and Emerging Diseases, Neurosciences, Neurology and Psychiatry, Physiopathology of human diseases, Life Physics and Chemistry, and Biotechnology Research and Innovation programmes. An exhibition held in the wings of the symposium and displaying more than 200 posters also stimulated much discussion.



CAROTTE CHALLENGE,**FROM 27 JUNE TO 1 JULY IN BOURGES**

The DGA (Direction Générale de l'Armement – French defence procurement agency) and the ANR have initiated a challenge called CAROTTE (a French acronym standing for “robotic mapping of a territory”), in which each team had to produce an autonomous robotised system capable of finding its way in a closed space and recognising the objects in it and provide a mapping of this unknown space along with semantic annotations.

CLOSING SEMINAR FOR THE SSH PROGRAMME “CONFLICTS, WAR(S) AND VIOLENCE”,**15 JUNE 2011 IN LYON**

Understanding the dynamics of conflicts, whatever their intensity, their scale, their dimension, their form, the individual or the groups they involve, is one of the keys to the understanding of the social world, its institutions and its transformations.

YOUNG RESEARCHERS SYMPOSIUM ON AGRONOMIC AND ECOLOGICAL SCIENCES,**13 AND 14 SEPTEMBER 2011 IN MARSEILLE**

This symposium entitled “From molecules to ecosystems” concerned the 2007 and 2008 editions of the “Blanc” and Young Researchers” programmes. More than 200 partner teams involved in some one hundred projects were invited to present the results of their work.

**THE “ENERGIES OF THE FUTURE: RESEARCH AND INDUSTRY” SYMPOSIUM,****6 OCTOBER 2011 IN BELFORT**

assembled more than 160 people from the major local academic and industrial players. Each ANR programme relating to energy was presented at this symposium: Renewable Electricity Production and Management, Sustainable Transport and Mobility, Sustainable Buildings and Cities, Efficient and Decarbonised Energy Systems, Bio Materials and Energies, and some examples of projects with a high regional impact.

PNRA (NATIONAL FOOD AND NUTRITION RESEARCH PROGRAMME) ASSESSMENT SYMPOSIUM EDITIONS 2006 AND 2007**FROM 25 TO 27 OCTOBER IN PARIS**

This symposium provided the stage for discussions on new knowledge and innovation in food and nutrition.

THE NATIONAL NANOSCIENCES AND NANOTECHNOLOGIES DAYS 2011 (J3N),**FROM 7 TO 9 NOVEMBER 2011 IN STRASBOURG**

Organised jointly by the ANR and the C’Nanos (French Centres of Competences in Nanosciences), this is the reference national symposium on nanoscience and nanotechnology.

POST-DOCTORAL RETURNS AND CHAIRS OF EXCELLENCE SYMPOSIUM,**8 NOVEMBER 2011 IN PARIS**

on the theme of the Attractiveness of France and international mobility

// TRANSNATIONAL SEMINARS

Working in collaboration with its foreign counterparts, the ANR organises and takes part in international seminars as part of the European ERA-NET actions, and in the framework of its bilateral and multilateral partnerships. The aim of these scientific events is either to identify topics for future calls, or organise brokerage events to prepare common transnational proposals or to monitor the progress of the financed projects and share information between the project teams of a given community. Each project team presents its progress, its achievements, and the future work planned. These seminars also provide an opportunity for the researchers from the various countries to meet one another.

TRANSNATIONAL FRANCO-TAIWANESE PROJECT MONITORING SEMINAR,

17-18 OCTOBER 2011 IN TAIPEI,
TAIWAN

The ANR and its Taiwanese counterpart, the National Science Council (NSC), organised a seminar held on 17 and 18 October 2011 in Taipei, to monitor the progress of the Franco-Taiwanese projects funded since 2007 by the agencies in the framework of the Blanc International and Technologies for Health (TecSan) programmes. Attended by nearly 90 scientists, this seminar enabled the French and Taiwanese researchers representing 20 co-funded projects, to present their research work. It embodied the excellent level of collaboration that has prevailed between the two agencies since 2007, in areas as varied as the ICSTs, Biology and health, Social sciences and humanities, and the Environment. Given its success, the ANR and the NSC have decided to hold another seminar in Paris in 2013.



ERA-NET NEURON FINAL CONFERENCE, 27 OCTOBER, 2011, BERLIN, GERMANY

The Network of European Funding for Neuroscience Research (NEURON) project links 17 European national research funding programmes and funding activities in the field of disease-related neurosciences. The final meeting of the ERA-Net NEURON, funding phase I, was opened with a welcome note by Parliamentary Secretary of State, Dr. Helge Braun, BMBF, who stressed the importance of research into brain diseases and the former and current commitment of the BMBF to support this research in a national and international context. The meeting was attended by a total of 111 participants. Presentations were given by the coordinators of the NEURON-funded projects from the Joint Transnational Call 2008 "European research projects on neurodegenerative diseases of the central nervous system". Besides the scientific achievements, the added value of the collaboration and contributions of all project partners were stressed.

Young Investigators from the projects presented their results in dedicated poster sessions.



PROGRESS MONITORING MEETING FOR THE FRANCO-GERMAN FINANCED PROJECTS ON SSH,

JUNE 17-18, 2011, NICE, FRANCE

As part of ANR's collaboration on social sciences and humanities with the DFG, two progress monitoring meetings for the Franco-German financed projects are held per year, one for the social sciences, the other for the humanities, organised by ANR and DFG in alternation. The ANR organised the meeting on June 17-18, 2011 in Nice, France.



// AN ENGLISH VERSION OF THE WEB SITE

GIVING ACCESS TO THE RESULTS OF THE ANR CALLS AND THE SUMMARIES OF THE FUNDED PROJECTS



The ANR has a full English version of its web site that regularly provides information on its calls for proposals and transnational partnerships. The French and English versions of the site provide the scientific community with summaries of the projects funded by the ANR.

// PUBLICATIONS ADDRESSING A WIDER AUDIENCE

“ LES CAHIERS DE L'ANR ”

In 2009, the ANR launched a collection called “Les Cahiers de l'ANR” which addresses pertinent thematic questions that span the ANR's diverse calls for proposals. Through a cross-disciplinary approach, this collection brings the on-going research, innovations and technological advances in a particular field into perspective. What are the technological, societal, economic and prospective issues? What is the ANR doing in this particular field?

The reviews do not attempt to make an exhaustive study of their subjects. The aim is to explain the broad themes and present the projects financed by the ANR on these themes in the form of summary sheets. It is intended not only for researchers, but also for decision makers and a wider public.



✓ NANO-TECHNOLOGIES: a new paradigm July 2012

Nanosciences and nanotechnologies involve multiple scientific disciplines, such as physics, chemistry, ICT, engineering science and the

social sciences and humanities. Research on nanotechnologies generates high expectations because of the unique properties of matter at nanoscale, allowing us to envisage new functions that had been unthinkable until then. This publication presents projects funded by ANR covering fundamental, applied and economic aspects, as well as toxicological and ecotoxicological risks, and ethical issues related to the nanotechnologies.



✓ **ARTIFICIAL INTELLIGENCE AND ROBOTICS:**

“Confluences
of Man and the ICSTs”
March 2012

This publication presents 115 projects on the themes of artificial intelligence and robotics, subjects which are at the core of information and communication sciences and technologies, where the fundamental research into algorithms, models and methods runs hand in hand with the applications in numerous sectors such as health, transport, the Web, and industrial processes. Artificial intelligence and robotics are also subjects that greatly stimulate the imagination. It is important for the ANR to help demystify research in this field, and bring its rich scientific content to the fore.



✓ **HIGH-PERFORMANCE COMPUTING:**

a key technology for the future
January 2010

High-performance computing represents a ground-breaking revolution. This key technology, which is of strategic importance for the future, concerns not only supercomputers technology but also a very wide range of applications. Today the applications help promote discoveries and innovations in numerous scientific disciplines (physics, geophysics, biochemistry, etc.), in energy and nuclear activities, health and the environment, and many other industrial sectors.



✓ **SHARED ENERGY:**

a new vision of the residential environment,
the car and the territory
July 2010

Reducing greenhouse gas emissions resulting from the consumption of fossil fuels, and finding alternatives to oil, which will dry up in a few decades, are two major challenges that must be met to ensure the future balance of our societies. It will only be possible to ramp up renewable energies if they become economically competitive with respect to the energies predominant today. Incentives or regulatory mechanisms can help make them competitive, but the margins for progress also lie in greater efficiency in the technologies for capturing these energy resources. It is crucially important to find technical solutions to optimise the management of energy distribution networks and improve storage systems so that energy production can be better matched to the needs.



✓ **MOBILITY AND UBIQUITY:**

moving towards digital nomadism
June 2009

Movement of man is facilitated by the growth of the ICSTs. A new dimension - digital nomadism - is emerging. The ICSTs are capable of substituting for all sorts of human movements. The technology gives man a ubiquitous capacity. Man can intervene from a distance without being present in a precise place. The implications of a “mobile” society that is “constantly on line” are multiple. They necessitate posing the question of the telecommunication networks required for the future. They concern the mobility of people and are situated, for example, in the areas of intelligent transport or assistance to handicapped persons. They are related to the new social and communication links induced by the social networks and the virtual worlds, etc. They affect the core of the human dimension with its problems of security, health and the environment, among others., to the fore.

THE MAGAZINES IN SOCIAL SCIENCE AND HUMANITIES

In the field of social sciences and humanities, the ANR communicated on the results of its projects through two publications in cooperation with the publishing house Autrement:

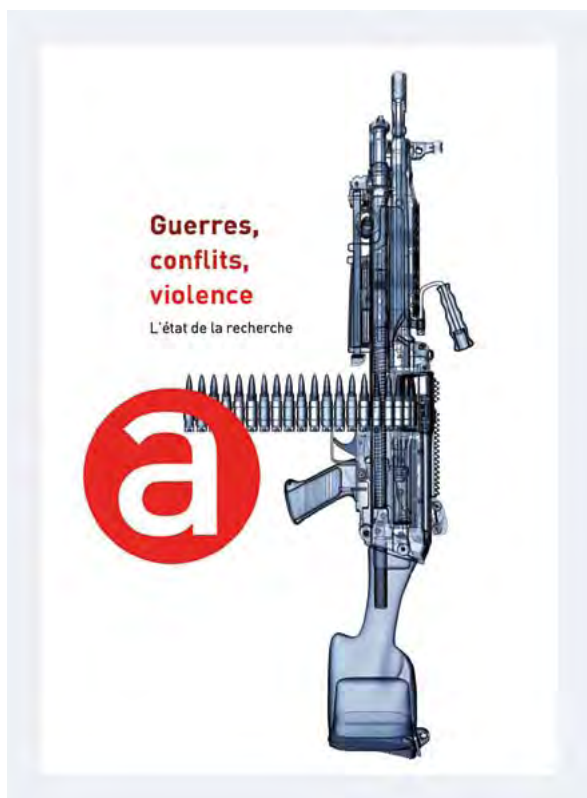
✓ THE MOOK (MAGAZINE BOOK)

Using varied texts and images, – studies, investigations, portraits, interviews, essays, travel logs, photos, illustrations – this brand new concept enables difficult subjects to be staged (a region, a societal debate, research work, etc.), by highlighting the players in the field, their work and their achievements, which often have low visibility.

Wars, conflicts, violence

The state of research

The Mook magazine provides an overview of the state-of-the-art research on the topic “Wars, conflicts, violence”, through summaries of ANR’s financed projects. From Prehistory to nowadays, from European to Nepalese, Arabic-Persian or American territories, from interstate war to urban violence, the Mook deciphers periods, places, and diverse themes, by means of a multidisciplinary approach.

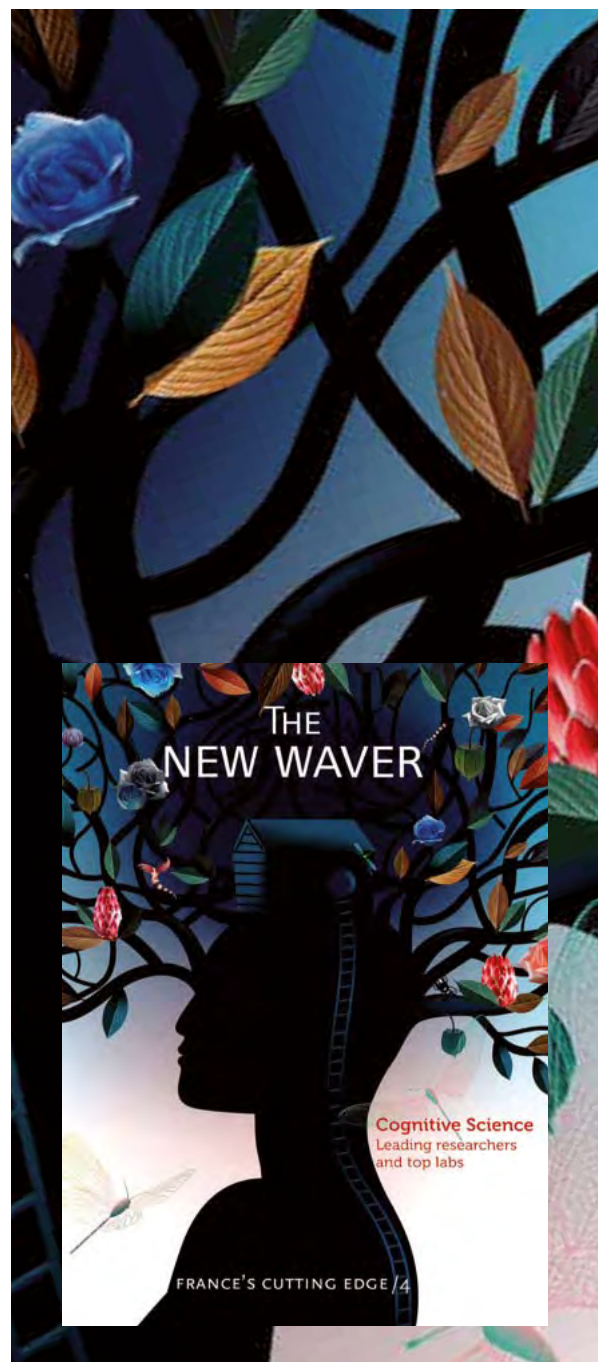


✓ THE NEW WAVER

Based on the editorial and graphic model of Le Mook, which is published in French, the New Waver provides a portrayal in English of the things that are moving in France, in all the societal, economic and technological sectors.

Cognitive science

France is at the cutting edge of a vital field of research spanning a variety of scientific disciplines and exciting new topics. This special issue focuses on scientists working in France and French-speaking countries who are making a difference to cognitive science worldwide.



// APPENDICES



// ANR PROGRAMMES 2011

PROGRAMME	Number of proposals submitted*	Number of projects funded	Selection rate	Total ANR funding (M€)**	Average funding per project (k€)
Chairs of Excellence	55	11	20%	5	455
Postdoctoral Return	179	32	17.9%	12.2	381
Blanc	2354	479	20.3%	202.5	423
Blanc International***	429	72	16.8%	18.6	258
Franco-German call for proposals in social sciences and humanities	72	17	23.6%	4.1	241
Franco-Japanese call for proposals in social sciences and humanities CHORUS	11	5	45.5%	0.4	80
France-Quebec call for proposals in social sciences and humanities	98	8	8.2%	1.2	150
Flash call for proposals "Great Tohoku Earthquake"	33	9	27.3%	0.9	100
Young Researchers	900	196	21.8%	39.6	202
BOTTOM-UP PROGRAMMES					
ERA-NET EuroNanoMed: Nanomedicine	29	7	24.1%	1.8	257
ERA-NET NEURON: Cerebrovascular Diseases	30	4	13.3%	1	250
META Quadrilateral call for proposals: Integrated Research on Genomics and Pathophysiology of the Metabolic Syndrome and the Diseases arising from it (Germany, Canada, Spain, France)	25	5	20%	1.5	300
ERA-NET E-Rare 2: Rare diseases	111	13	11.7%	2.1	162
ERA-NET EMIDA: Emerging & Major Infectious Diseases of Livestock	51	6	11.8%	1.4	233
Contaminants and Environments: Metrology, Health, Adaptability & usages (CESA)	96	22	22.9%	10.6	482
Biomedical Innovation in public-private Research Partnership (RPIB)	126	23	18.3%	19	826
Technology for health and autonomy (TecSan)	93	20	21.5%	16.5	825
Ambient Assisted Living joint programme (AAL) article 185	39	6	15.4%	3	500
Alzheimer's disease (MALZ)	47	8	17%	3.9	488
BIOLOGY & HEALTH					
Agrobiosphere: Viability and Adaptation of Productive Ecosystems, Territories and Resources in the Face of Global Changes	23	7	30.4%	3.7	529
Global Environmental Changes and Societies (CEP&S)	47	12	25.5%	7	583
Sustainable Production & Environmental Technologies (ECOTECH)	66	14	21.2%	10.4	743
ERA-NET NetBiome	29	7	20%	1.8	257
ERA-NET Biodiversa 2	37	4	10.8%	2.4	600
Sustainable Food Systems (ALID)	33	7	21.2%	5.8	829

// ANR PROGRAMMES 2011

PROGRAMME	Number of proposals submitted*	Number of projects funded	Selection rate	Total ANR funding (M€)**	Average funding per project (k€)
ENVIRONMENT & BIOLOGICAL RESOURCES (ERB)					
Sustainable Electricity Production & Management (PROGELEC)	72	17	23.6%	14.4	847
Energy efficient & decarbonised systems (SEED)	52	13	25%	9.8	754
Sustainable Land Transport (TTD)	35	10	28.6%	11.2	1120
Sustainable Buildings and Cities (BVD)	35	9	25.7%	7.3	811
SUSTAINABLE ENERGY					
Digital Engineering & Security (INS)	65	16	24.6%	11.8	738
Hardware & software infrastructures for the digital society (INFRA)	57	16	28.1%	16.9	1056
Digital Models (MN)	75	20	26.7%	12.8	640
ERA-NET CHIST-ERA	19	7	36.8%	2.24	320
INFORMATION & COMMUNICATION SCIENCES & TECHNOLOGIES					
Emotion(s) – Cognition - Behavior (EMCO)	62	13	21%	3.3	254
Changing societies: "Inequality – Inequalities"	47	11	23.4%	2.4	218
Innovative societies - Innovation. economy. living	31	7	22%	2.5	357
SOCIAL SCIENCES & HUMANITIES					
Materials & Processes for High Performance Products (MatetPro)	107	20	18.7%	17.3	865
Specific Support for Research Works and Innovation Defense (ASTRID)	196	42	21.4%	11.5	274
Nanotechnologies. Nanosystems (P2N)	144	29	20.1%	22.3	769
Concepts. Systems & Tools for the Global Security (CSOSG)	53	10	18.9%	9.9	990
ENGINEERING. PROCESSES & SECURITY					
Emergence of products, technologies & services with high value creation potential	245	51	20.8%	13.6	267
Inter Carnot-Fraunhofer Programme (PICF)	28	7	25%	2.3	329
PARTNERSHIPS AND COMPETITIVENESS					
Sustainable Production & Environmental Technologies (ECOTECH)	66	14	21.2%	10.4	743
ERA-NET NetBiome	29	7	20%	1.8	257
ERA-NET Biodiversa 2	37	4	10.8%	2.4	600
Sustainable Food Systems (ALID)	33	7	21.2%	5.8	829

* For transnational programmes, only projects with French partners are taken into account

** For transnational programmes, only ANR funding is taken into account

*** Franco-German call for proposals in Chemistry included

// TRANSNATIONAL COLLABORATIONS 2011

	Number of proposals submitted	Number of proposals submitted with French partners	Number of projects funded with French partners	ANR funding in M€
MULTILATERAL CALLS FOR PROPOSALS IN THE FRAMEWORK OF EU FP7 INITIATIVES				
ERA-NET CHIST-ERA	31	19	7	2.2
ERA-NET E-Rare 2	149	111	13	2.1
ERA-NET NEURON 2	57	30	4	1
ERA-NET EMIDA	98	51	6	1.4
ERA-NET EuroNanoMed	41	29	7	1.8
AAL 185	106	39	6	2.9
ERA-NET Biodiversa 2	53	37	4	2.4
ERA-NET NetBiome	35	29	7	1.8
ERA-NET Electromobility+	-	5	1	0.7
MULTILATERAL JOINT CALLS FOR PROPOSALS				
ORA Multilateral call for proposals in social sciences: Germany-UK-Netherlands-India-France*	41	15	2	0.09
META Quadrilateral call for proposals: Integrated Research on Genomics and Pathophysiology of the Metabolic Syndrome & the Diseases arising from it (Germany. Canada. Spain. France)	28	25	5	1.5
BILATERAL JOINT CALLS FOR PROPOSALS				
France-Quebec call for proposals in social sciences & humanities (ANR-FQRSC)	98	98	8	1.2
Franco-Japanese call for proposals in social sciences & humanities CHORUS (ANR-JSPS)	11	11	5	0.5
Franco-German call for proposals in social sciences & humanities (ANR-DFG)	72	72	18	4.1
Franco-German call for proposals in chemistry (ANR-DFG)	79	79	15	3.6
FLASH Franco-Japanese call for proposals « Great Tohoku Earthquake » (ANR-JST)	33	33	9	0.9
Inter Carnot-Fraunhofer Partnerships (PICF)	28	28	7	2.3

// TRANSNATIONAL COLLABORATIONS 2011

	Number of proposals submitted	Number of proposals submitted with French partners	Number of projects funded with French partners	ANR funding in M€
OPENING OF NATIONAL PROGRAMMES				
TecSan (Technologies for health) with Taiwan (NSC)	0	0	0	0
CSOSG (Global security) with Germany (BMBF)	49	49	10	9.9
CEP&S (Global environmental changes) with Brazil (FAPESP-FACEPE)	1	1	1	0.5
ECOTECH (Ecotechnologies – Water) with China (MOST)	7	7	0	0
TTD (Sustainable Land Transport) with Germany (BMBF)	0	0	0	0
BLANC INTERNATIONAL PROGRAMME**				
Austria (FWF)	43	43	8	2.1
Brazil (CNPq)	34	34	5	1.1
Brazil (FAPESP-FACEPE)	5	5	1	0.7
Canada (NSERC)	22	22	3	1
China (NSFC)	72	72	12	2.6
South Korea (NRF)	33	33	3	0.8
USA (NSF)	26	26	6	1.7
Mexico (CONACYT)	34	34	6	1.9
Romania (ANCS)	40	40	5	1.2
Taiwan (NSC)	41	41	8	2.3
INTERNATIONAL COLLABORATIONS WITHOUT FORMAL AGREEMENTS				
P2N – Nanotechnologies	10	10	0	0
TTD – Sustainable Land Transport	1	1	0	0
SEED – Energy systems	4	4	2	1.4

* Call launched in the framework of a Foresight Workshop (ARP)

** Blanc International 1 & 2 programmes

Handwriting practice area with 32 horizontal dotted lines.



Editorial coordination Marie-Ange Folacci, assisted by Aline Tournier
Editorial team Sophie Ferrand and Nakita Vodjdani
Graphic Design Agence SBBA
Printing Navis

Octobre 2012
ISSN : 1955-7086





www.agence-nationale-recherche.fr

Tél. : +33 (0)1 78 09 80 00

212 rue de Bercy
75012 Paris France

