



RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

anr [©]
agence nationale
de la recherche
AU SERVICE DE LA SCIENCE



2020 annual report summary

PAGE 02.
Editorial

PAGE 06.
Profile

PAGE 10.
2020 in figures

PAGE 12.
2020 highlights

PAGE 16

Covid-19

PAGE 16. ANR works alongside scientific communities **PAGE 18.** Minimising the impact of the crisis on scientific communities **PAGE 19.** In-house departments step up to the plate **PAGE 20.** Three tailored calls for proposals to meet new challenges **PAGE 22.** Over 270 research projects funded in response to the epidemic

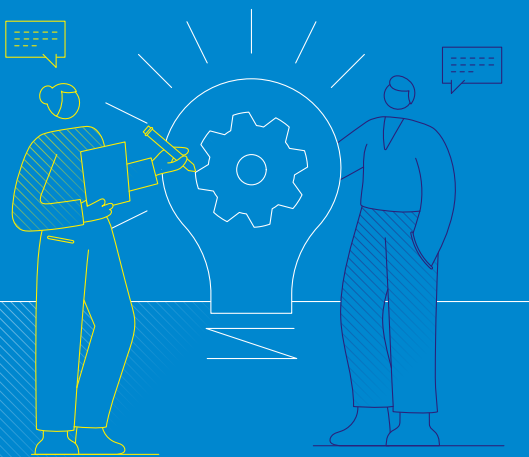


PAGE 26

1. An agency committed to research

PAGE 28. The ANR Tour: online events for research stakeholders **PAGE 30.** Open science: a commitment to sharing scientific knowledge **PAGE 32.** Gender equality: ANR's commitment through its work plan **PAGE 34.** PIA: Paris Sciences et Lettres and Paris-Saclay universities confirmed as IdEx **PAGE 36.** Supporting the development of artificial intelligence in France and around the world **PAGE 37.** Neurodegenerative diseases: a review of eight years of research





PAGE 38

2. Responding to the needs of all research

PAGE 40. 2020 Generic Call for Proposals: over 1,200 projects selected

PAGE 44. Partnership-based research: ANR at the crossroads between academic research and the business world PAGE 48. Europe and the world: supporting French research internationally

PAGE 52. Scientific projects

PAGE 72

3. Organisation and governance

PAGE 74. Human resources: strengthened projects PAGE 76. The Agency's budget PAGE 78. Organisation chart PAGE 80. The Governing Board PAGE 81. The Scientific Advisory Panel



PAGE 82

4. Appendices

PAGE 84. Review of 2020 calls for proposals

PAGE 86. Review of 2020 calls for proposals - Credit breakdown by beneficiary type (values and percentages) PAGE 90. Breakdown by education authority PAGE 91. Investments for the Future



EDITORIAL

“Listening to all research actors to produce responsible knowledge for the benefit of society”

Thierry Damerval
ANR President and CEO

2020 was an exceptional year. Proposition: What is your assessment on the actions you have carried out in the context of the Covid crisis?

The health crisis we are still experiencing today reminds us of the importance of research. It naturally led the Agency to adopt an unprecedented approach, with equally unprecedented processes to support the mobilisation of scientific communities within the scope of ANR's responsibility, which does not include clinical research.

In February 2020, the Agency began working with the REACTing consortium and the Ministry of Higher Education, Research and Innovation (MESRI) to launch Covid-specific calls for proposals, complementing the other calls, in association with other institutions such as the Fondation de France, the Foundation for Medical Research and France's regions. International collaborations have also been developed with partner agencies.

Above all, I want to commend the work of our teams and the scientific panels, who made great efforts to ensure ANR's missions could continue. Thanks to each and every one of them, the Agency has once again demonstrated its ability to respond efficiently to urgent situations and to involve the whole scientific community.

This period is obviously rich in lessons to be learned. It reminds us of the importance of taking into account all the dimensions of such an event – the health aspects, but also all the questions drawing on a wide variety of skills in the social sciences and humanities. It shows the need to support all types of organisations involved in research, including both

“ANR has once again demonstrated its ability to respond efficiently to urgent situations and to involve the whole scientific community.”

public- and private-sector laboratories, with a wide range of uses for funding – staff, equipment, operations – as specified in ANR's funding rules.

In organisational terms, fast, responsive mechanisms were put in place to select projects urgently (Flash Covid) while retaining all the rigour of the review process. We also created a scheme open for several months during the year (the RA-Covid call) to support new projects as the epidemic evolved, again maintaining the same rigorous standards as the projects were reviewed in waves. This action continued



with the Resilience Covid call and the Covid-19 priority enshrined in the Agency's 2021 Work Programme, published in July 2020.

Important initial results have already been achieved in the fields of biology and pathophysiology. But going beyond the health aspects, these calls have also enabled support for the development of very broad expertise in preventive measures, how they are perceived by the population and the impacts of the pandemic.

We can only welcome this effort to produce new knowledge, which has provided valuable insight during the crisis. It constitutes a body of data that will undoubtedly be extremely important in putting the pandemic in perspective and preparing for future health crises.

This year was also marked by the research programming law, which significantly increases the agency's budget from 2021 thanks to the French Recovery Plan. What will the impact be?

The new research programming law (LPR) clearly brings the budgets for French research back to growth and offers prospects for strengthening its position on the international stage. The law consolidates ANR's missions within

the research and innovation ecosystem and strengthens its resources for intervention so that it can better respond to the needs of laboratories and research institutions.

The agency's 2021 budget provides €1.2 billion in spending to fund research projects, a level that has never been seen since its creation. The budget has seen a historic increase since 2020 thanks to the French Recovery Plan, which boosts this momentum and will make all the difference in laboratories from 2021 onwards.

The financial contribution to recipient laboratories and research units known as the "preciput" has also grown significantly, enabling the capacity for action in terms of science policy to be developed.

In this context, in line with its primary mission, ANR continues to allocate a substantial proportion of its funding via an "investigator-driven" approach, i.e. through non-targeted calls for proposals. This is where scientific and technological breakthroughs and original solutions often emerge.

To take the full diversity of research needs into account, we must also reinvest in partnership-based research, including the LabCom programme for setting up research facilities shared between a public laboratory and an SME or mid-sized company, and industrial chairs for supporting private-sector R&D investment in association with the academic sector. In 2021, the Carnot institute scheme will see the credits allocated to these recipients rise by over 30%.

ANR also helps to expand research contributions to the public policies put forward by central and local government. Cooperation projects have been initiated with several regions to improve the coordination between regional research plans and national strategies.

Finally, this budget increase will allow us to strengthen ANR's policy of openness in terms of spreading scientific and technical culture, analysing how scientific language is received and conducting participatory research through specific calls for proposals to be launched in 2021. The law requires us to devote 1% of our funding budget to these initiatives.

ANR is also the national operator managing the Investments for the Future programmes (PIA) in the field of higher education and research. The special strength of the PIAs is their capacity to support large-scale projects over the long term. They have played a major role in structuring higher education and research in France for over 10 years. The fourth PIA, which has just been launched, consolidates this focus on large catalyst programmes in strategic fields for our society. ►►►

The 2021–2025 CONTRACT between the French government and ANR

Six major strategic directions
“in the service of science”

This new contract of objectives and performance falls within the research programming law (LPR) for 2021–2030, which consolidates ANR’s missions and significantly reinforces its resources, confirming its major role in the field of project-based research funding in France “to contribute to increasing research input into all public policies put forward by France’s national and local government”, as specified in the report attached to the law.



“This is an important moment for the agency, because this contract of objectives and performance will set the pace of the institution over the next few years by setting a course and establishing milestones. But it is also an important step for the Government, as ANR has emerged as a key player in its research policy in only 15 years of existence, and this contract renews the bond of trust that binds them.”

FRÉDÉRIQUE VIDAL
MINISTER OF HIGHER
EDUCATION, RESEARCH
AND INNOVATION

PRIORITY 1. SUPPORT RESEARCH IN ALL ITS DIMENSIONS IN SERVICE OF ALL SCIENTIFIC COMMUNITIES

Supporting research in all its forms (partnerships, young researchers, innovation) on the basis of projects designed by the researchers themselves and on the principle of peer review based on scientific excellence. The goal is to encourage scientific creativity in all disciplines and to answer the questions raised by today’s major transitions: the ecological and energy transition, digital transformations, the science of sustainability, global health etc.

PRIORITY 2. STRENGTHENING PARTNERSHIPS AT THE NATIONAL LEVEL WITH ALL TYPES OF FUNDING BODIES AND RESEARCH AND INNOVATION STAKEHOLDERS

ANR has always forged strategic partnerships with other research funders and players. The aim is also to encourage the economic, clinical and societal exploitation of research results, with actions to support innovation and partnership-based research between public institutions and private companies.

PRIORITY 3. PROMOTING EUROPEAN AND INTERNATIONAL COOPERATION TO CONTRIBUTE TO THE INFLUENCE OF FRENCH RESEARCH

In accordance with its mission, ANR plays an active role with other European and international funding agencies, concentrating its resources on strategic cooperation. It also contributes to strengthening the position of French teams at European level.

PRIORITY 4.**PROMOTING RESPONSIBLE RESEARCH CONDUCT, FROM THE LABORATORY TO THE WHOLE OF SOCIETY**

Committed to scientific integrity, open science and gender equality, ANR promotes the responsible conduct of research. In line with its values, this involves strengthening the quality of selection, sustainable development, the sharing of results, the dissemination of scientific culture and the promotion of participatory research.

PRIORITY 5.**STRENGTHENING PROJECT FOLLOW-UP AND EX-POST EVALUATION, AND USING THIS EVALUATION TO SERVICE SCIENCE AND SOCIETY**

ANR collects a large amount of data on both the projects submitted and the projects selected. In this context, it will reinforce its analysis of how research availability evolves and improve its measurement of the impact of the funding allocated to it with a view to communicating about the production of these studies.

PRIORITY 6.**OPTIMISING OPERATIONS IN THE SERVICE OF RESEARCH AND BENEFICIARIES – BEING THE AGENCY THAT FACILITATES ACCESS TO FUNDING**

The simplification and modernisation of its operations are a central concern within the Agency, alongside strengthening communication and dialogue with researchers and partners.

“The 2021 budget has seen a historic increase, which will make all the difference in laboratories from 2021 onwards.”

►►► **You have signed the new Contract of Objectives and Performance with Frédérique Vidal, the Minister of Higher Education and Research. Does this mark a new stage for ANR?**

The 2021–25 Contract of Objectives and Performance between the state and ANR was signed at an unusual time for the Agency. In this crisis context, questions of scientific integrity and relationships between science and society take on a fundamental dimension. What’s more, the LPR that includes this new COP offers new prospects and new opportunities for the scientific world.

ANR has charted an ambitious strategic course that takes into consideration the diversity of needs in all research areas. We take care to remain attentive to all research actors for the production of knowledge for the benefit of society.

This is the meaning underlying the new 2022 Work Programme we have just published, which offers new adaptations to our support mechanisms to take the full diversity of disciplines into account. Major work to collect and analyse proposals has been carried out during 2020 with the Programming Advisory Panels, which bring together representatives of MESRI and other ministries, the thematic research alliances, each covering a broad field of research (Aviesan, Ancre, Allistène, AllEnvi and Athéna), CNRS, the Conference of University Presidents (CPU) and private research. With nearly 20,000 research projects supported in all fields since its creation, many scientific and technological successes, major knowledge acquisition, commercial achievements and medical advances, ANR has been helping to support the excellence of our research and its impact on the whole country for over 15 years. We are an Agency committed to the “service of science”, a signature that now accompanies our new logo to underline this commitment.

PROFILE

Supporting all research, from the laboratory to society

Scientific communities, businesses, local authorities, institutions – ANR has been supporting all these stakeholders since it was founded in 2005.

A public body under the authority of the French Ministry for Higher Education, Research and Innovation (MESRI), the Agency funds and promotes the development of scientific research in all its forms with finance arranged through calls for proposals. ANR helps to develop basic and applied research, encourage academic and public-private scientific partnerships and promote European and international cooperation. To encourage responsible research management, the Agency is committed to scientific integrity, gender equality and open science. It stimulates the production of knowledge and innovation by supporting the best scientific projects and research teams. At the heart of French research, ANR funds and promotes high-quality research for the common good and to meet the challenges of the future. Its activities are governed by France's research programming law, the French Recovery Plan and European and international research funding initiatives. Competitive calls for proposals, a rigorous project selection and tracking process, peer review – the Agency encourages initiatives among young researchers, technology transfer, international participation by French research teams and responses to specific or urgent research needs.



1,712
projects in 2020,
over 20,000 since 2005

anr®
agence nationale
de la recherche
AU SERVICE DE LA SCIENCE



A trusted operator

ANR has been specially contracted by the French state to manage its Investment for the Future programme (PIA) in the field of higher education and research since 2010. This role involves managing the calls for proposals, organising the selection, negotiating agreements, providing funding, monitoring and reviewing the impact of the projects and the activities of the PIA 1, 2, 3 and 4 programmes.

5 missions

defined in the decree of 1 August 2006, amended in 2014



Fund and promote

the development of basic and targeted research, technological innovation, technology transfer and public-private partnerships.



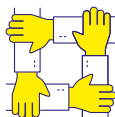
Implement

the programme approved by the Minister of Research, following consultation with the ministers responsible for France's research organisations and public higher education institutions.



Manage

major government investment programmes in the fields of higher education and research and oversee their implementation.



Foster

greater scientific cooperation across Europe and worldwide by aligning the Agency's Work Programme with European and international initiatives.



Analyse

trends in research provision and assess the impact of the funding allocated by the Agency on scientific output in France.

A shared vision

for responsible knowledge production

Listening to and working alongside research stakeholders, open to a changing world and a changing society, ANR shares common goals with all scientific communities, public and private organisations and civil society. It helps to give French research and its innovations a leading international position and confirms its role as the partner of bold, innovative, creative, interdisciplinary, cooperative research that generates knowledge and transfers it to society for the benefit of everyone. Working on behalf of the French state but acting independently, ANR has the resources to fulfil its missions.

Strong values

Quality

of the framework in which employees work, the services delivered to users and the Agency's selection procedures (ISO 9001 certification). This value incorporates the notions of excellence, adaptability, reliability and efficiency. It contributes to an approach based on continuous improvement and the prevention of bias.

Fairness

in the way projects and people are treated (employees, peer reviewers, project coordinators), including the concepts of impartiality, probity, ethics, neutrality, integrity, gender equality and respect for diversity and plurality.

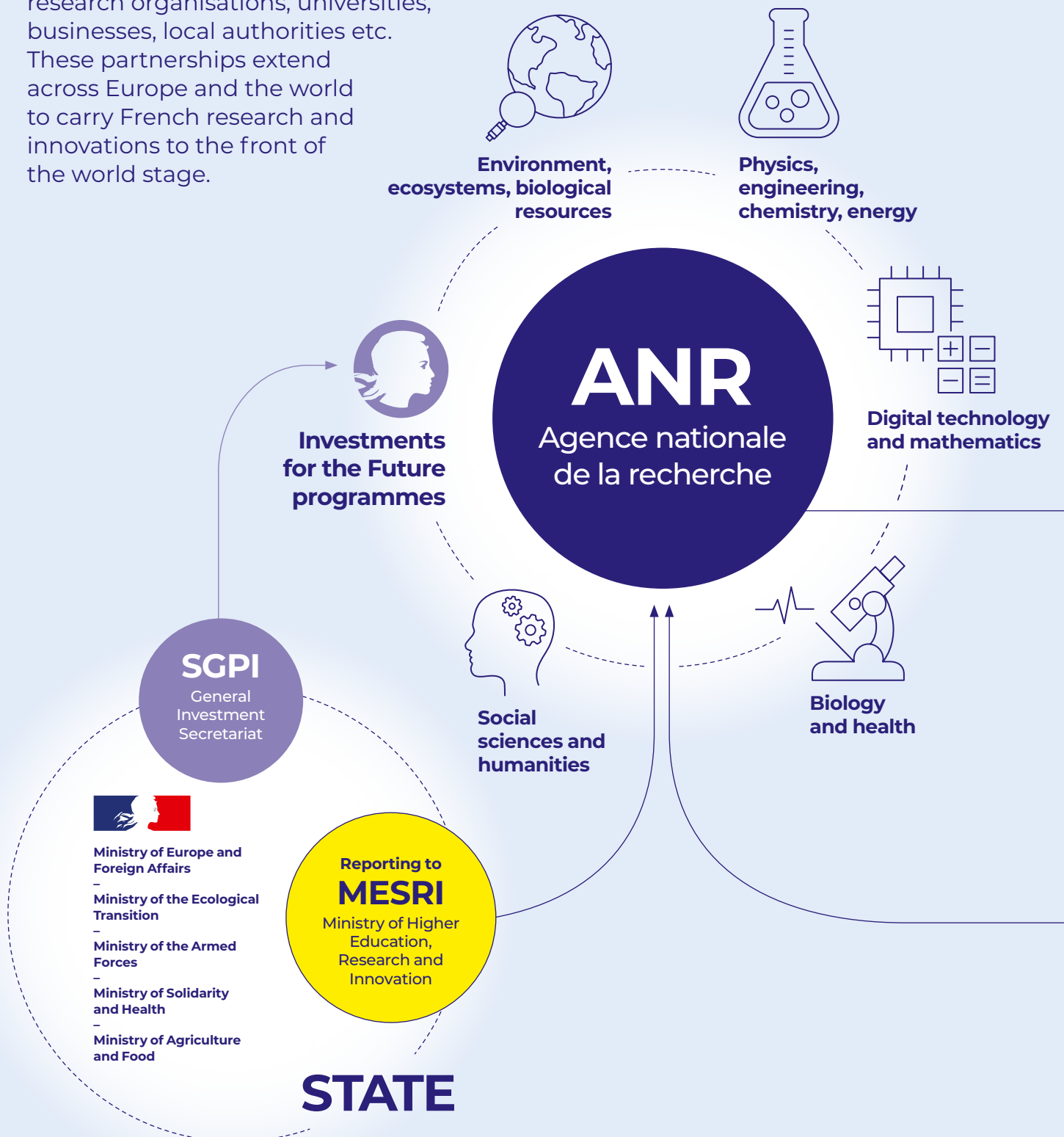
Transparency

of processes, missions and open science. Transparency encompasses the notions of trust and social responsibility. It includes a commitment to open data and the publication of indicators, including gender breakdowns.

PROFILE

The ANR ecosystem

The Agency's work is part of a huge ecosystem of higher education, research and innovation. It maintains close relationships with the main funding bodies and research players: government ministries, public research organisations, universities, businesses, local authorities etc. These partnerships extend across Europe and the world to carry French research and innovations to the front of the world stage.



SCIENTIFIC COMMUNITY



Research organisations
CNRS, CEA, Inserm, INRAE, Inria, IRD...



Universities and higher education institutions



Businesses

RESEARCH STAKEHOLDERS

Scientific evaluation panels

Funding bodies
AID, AFD, Bpifrance, Ademe, Anses, OFB, ANRS

Regions
Normandy, Pays de la Loire, Hauts de France....

Foundations and associations
FRM...

Consultative bodies
C.P.U., C.D.E.F.I., CNESER, C.N.C.S.T.I....

Research alliances
AllEnvi, Avisan, Athena, Ancre

EUROPE AND THE WORLD



Research funding agencies
DFG, JST, NSF...

ANR is a member of the following bodies:




European Commission

2020 in figures

Activity

€780.5 m

of funding budget (commitment authorisations) in 2020, including: €620m allocated to calls for proposals, €62m for the Carnot programme, €99m outside the components of the Work Programme (Préciput, INCa etc.)



€40.5 m

of operating budget in payment appropriations in 2020

37%
men

323
employees

63%
women

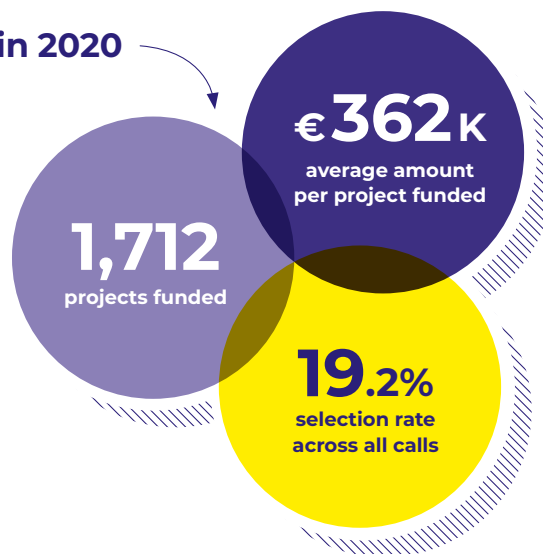


Projects funded

21,745

projects funded since ANR was founded dated December 31, 2020

in 2020



Investments for the Future



€13.51 bn

under contract (from the PIA launch until the end of 2020)

€10.26 bn

disbursed (from the PIA launch until the end of 2020)

€3.86 bn

of co-funding received by the projects (from the PIA launch until the end of 2019)

Funding offer

6 instruments dedicated to “specific” calls for proposals. LabCom, Industrial Chairs, MRSEI, Springboard-ERC, international calls, Challenges

4 instruments funded through the national research programme to strengthen the French artificial intelligence ecosystem: International Attractiveness Chairs, CIFRE theses (ANRT), AI PhD programme and AI LabCom

€30.2m in 2020

3 calls funded through Covid initiatives: Flash Covid-19, Research-Action Covid-19 and Resilience Grand-Est

€19.1m in 2020

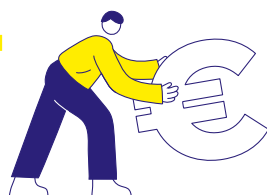
1 ASTRID programme fully funded by AID (DGA)

€9.3m in 2020

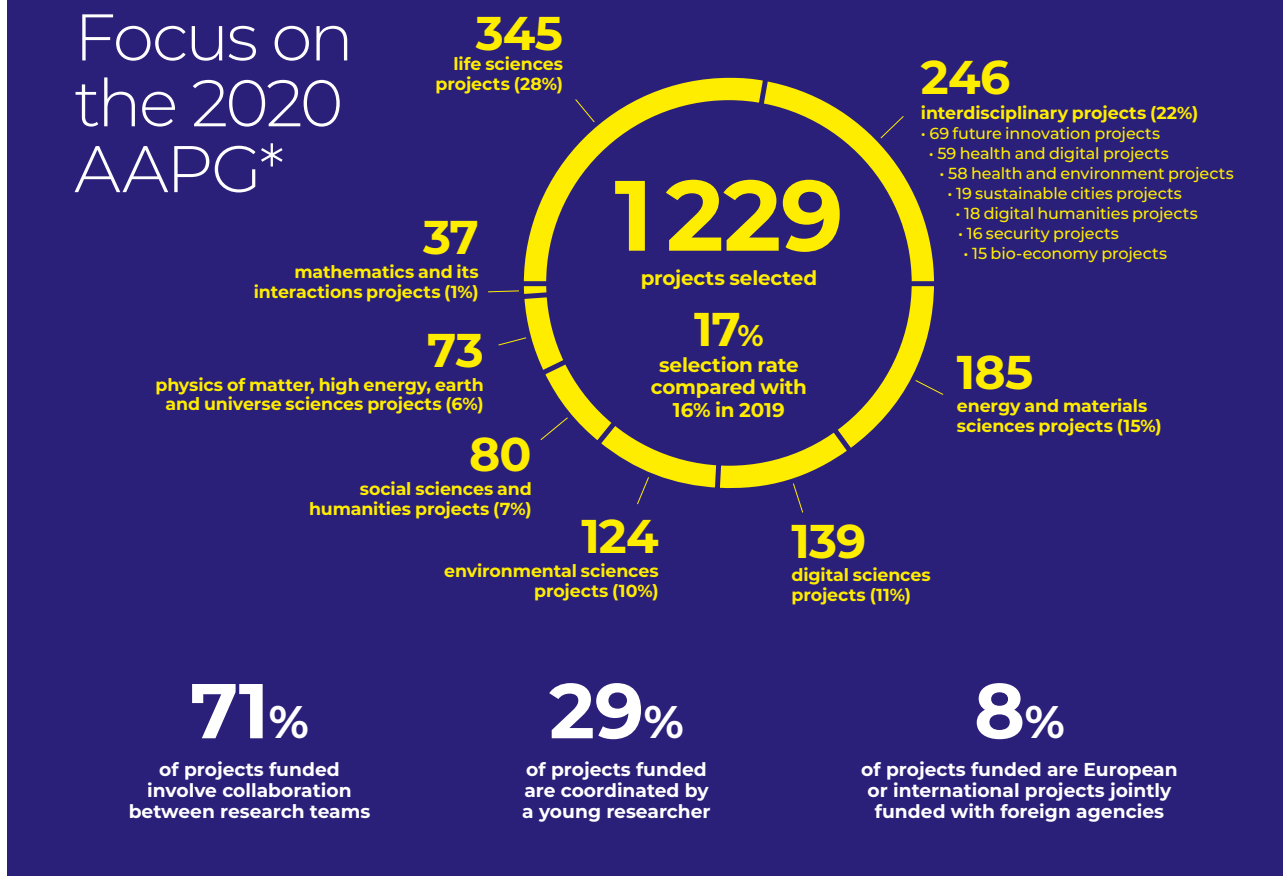
4 AAPG* instruments: PRC, PRCI, PRCE, JCJC
€499.7m in 2020 compared to €464.2m in 2019

Funding for the Carnot programme for certified laboratories (excluding calls for proposals)

€62m in 2020



Focus on the 2020 AAPG*



*AAPG: Generic Call for Proposals.

ANR'S YEAR

2020 highlights

February

37 Carnot Institutes certified (1)

Thirty-seven Carnot Institutes received MESRI approval for four years. Two others were in an 18-month probationary period under the Carnot Springboard programme. ANR received an additional €62 million a year to strengthen partnership-based research.

Launch of a CEI with Normandy

Following the fire at the Lubrizol factory in Rouen, ANR launched a call for expressions of interest in collaboration with the Normandy region. The aim is to highlight innovative operational solutions in the field of industrial risk management in dense urban settings. In October, the Agency

came together with the Normandy and Hauts-de-France regions to launch the SIOMRI Research-Action Call for Proposals to fund urgent, rapid projects that would generate results within 12 to 24 months.

SSH conference and review (2)

On 25 and 26 February, the Social Sciences and Humanities Department organised the SSH days at the French Ministry of Higher Education, Research and Innovation. This was a chance for winners of the 2019 Generic Call for Proposals to discuss and present their SSH projects at seven round-table events focusing on issues such as culture and creation, economic and social innovation, health and society.

March

A first call for proposals in response to Covid-19 (3)

As the health crisis spread, ANR took part in the national research effort. Between 6 and 25 March, it launched an initial "Flash" call for proposals to support Covid-related research projects lasting less than 18 months. The following month, the "RA-Covid-19" call was launched, open until 28 October, for research projects lasting three months to a year, still focusing on the epidemic. In December, it launched "Resilience Covid-19", a third call open until March 2021, to support projects targeting new areas relating to the evolution of the epidemic. Altogether, the Agency has financed 279 projects.

June

Signature of a declaration in favour of open science (4)

On 29 June, ANR signed a joint declaration in favour of open science with Ademe, Anses, INCa and Inserm/ANRS. By means of a discussion network and a concerted approach, the five funding and research agencies aim to promote access to publications and the sharing of data and knowledge.

July

Participation in "Un Rêve d'Avignon" (5)

The Agency and the Festival of Avignon, operating as "Un Reve d'Avignon", came together once again for a unique digital event from 3 to 25 July, highlighting creation and memories of past works. As the organiser of the "Rencontres recherche et création", ANR selected 20 videos from past editions to trace the evolution of our society and current events.

An work plan for gender equality (6)

ANR announced an work plan for gender equality and gender mainstreaming. Part of the European Gender-SMART project, it includes several actions to be carried out over the 2020-2023 period in three areas: culture and organisation, human resources and research funding.

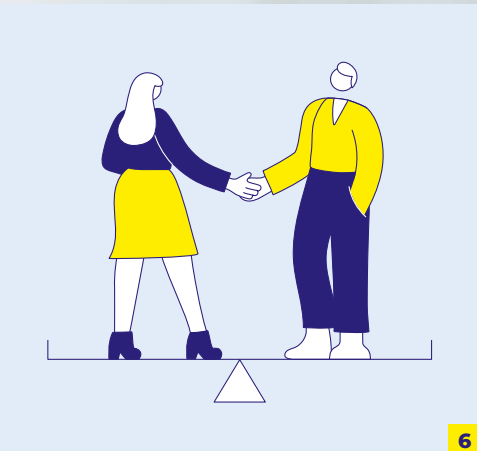




1



La recherche
pour l'innovation
des entreprises



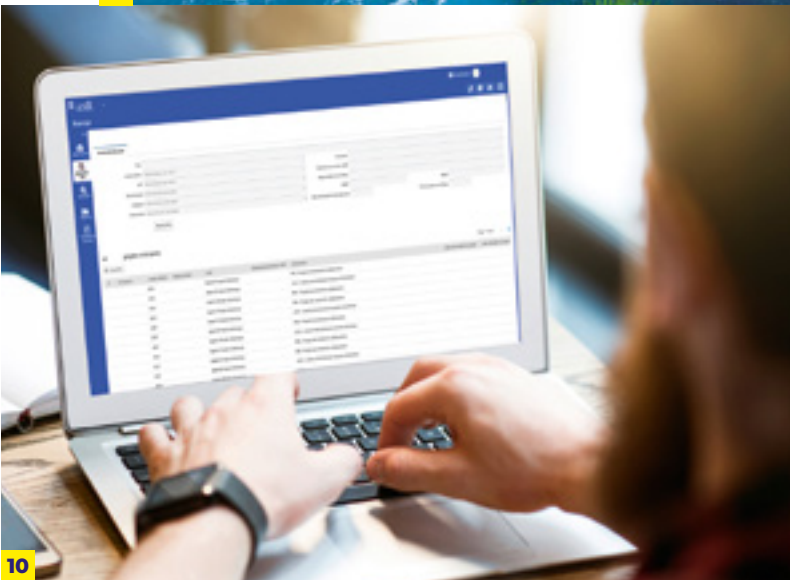
8



7



9



10



11

September**Publication of a report on genomics and agroecology (7)**

ANR published its 12th thematic report on “The contribution of genomics to agroecology”. Targeted at scientific communities and political decision-makers, it analyses the funding of genomics projects since 2005, presents projects relevant to agroecology and proposes priority directions for genomics research to support agroecology work.

October**Partner of the 29th Fête de la Science (9)**

During the Fête de la Science festival, from 2 to 12 October, ANR experts and researchers funded by the Agency took part in the daily “Science en direct” programme to promote the Fripon project and the ROSE challenge (robotics and sensors for eco-friendly plant health) and report on international efforts to manage large-scale sargassum deposits.

Signature of an agreement with the Pays de la Loire (8)

ANR and the Pays de la Loire region signed a territorial agreement covering the period 2020–2023. Its aim is to support research and innovation, primarily by assisting and financing research teams. The agreement also offers prospects for new collaborations on the region's priority research themes.

Launch of the project tracking platform (10)

The Agency launched <https://suiviprojets.anr.fr>, a new tool designed to improve the monitoring of the research projects submitted and financed and provide access to information on project progress, partners, deliverables etc.

ANR Tour: a series of webinars (11)

The Agency reinvented itself for the 2021 ANR Tour, offering a series of informative webinars and discussions. The programme included a presentation of the 2021 Work Programme, the 2021 Generic Call for Proposals, the different calls oriented towards Europe and further afield, the financial regulations, new tools for project monitoring etc.

December**Conference on neurodegenerative diseases**

On 8 December, ANR and ITMO NNP organised a virtual conference on neurodegenerative diseases such as Parkinson's, Alzheimer's and multiple sclerosis. This was an opportunity to review scientific progress in areas such as diagnosis, therapeutic avenues and the understanding of how these conditions evolve. A thematic report was also published: “Neurodegenerative diseases: the challenge for neuroscience”.

EquipEx+: 50 projects selected

The 50 projects selected for the ESR (large-scale research



422
million euros
of funding for
the 50 successful
EquipEx+ projects



facilities)/EquipEx+ call for expressions of interest were announced. They include HIPE on understanding human performance, TIRREX on the development of new robotics platforms and InfectioTRON on preventing and managing infectious diseases. A total of €422 million is allocated to these new projects.

Covid-19 : ANR works alongside scientific communities

Exceptional times require exceptional measures.

Even before the first lockdown was announced in March 2020, ANR was doing everything it could to continue its work, strengthen its support for scientific communities and contribute to the fight against the pandemic. An unprecedented challenge for research stakeholders and the Agency's teams.



“We could not have been more responsive,” declares ANR’s Scientific Operations Director, Yves Fort: faced with the pandemic, 2020 saw the Agency mobilise on an exceptional scale it had never seen before. To respond to the urgency of research needs, anticipate the progress of the Covid-19 epidemic and limit its impact, ANR overhauled its entire



“The mobilisation of our teams was total and, despite lockdown conditions that were sometimes difficult, we managed to fulfil all our missions.”

YVES FORT
ANR’S SCIENTIFIC
OPERATIONS DIRECTOR

organisation, including adapting its Work Programme and offering new specific calls for proposals adapted to the context of the epidemic. This adaptation affected review procedures, the timetables for calls for proposals, agreement negotiation and the organisation of the ANR Tour (see p. 28).

Clear priority for Covid-19

An initial specific call for proposals, Flash Covid-19, was launched in March in response to the emergency, followed by two more during 2020: RA-Covid-19 and Resilience Covid-19 (see p. 20). All three calls had the same ambition – to support the national research effort and help to manage the pandemic with accelerated funding arrangements. Published during summer 2020, ANR’s 2021 Work Programme was prepared with input from institutional research stakeholders brought together in seven programming advisory panels. In view of the new challenges imposed by the crisis, the Programme incorporated a “Covid-19” priority for all the Agency’s funding instruments and programmes, including the 2021 Generic Call for Proposals, whose budget was raised by an unprecedented amount, from €499.7 million to nearly €791.9 million. This commitment was enshrined in the research programming law and was accelerated by the French Recovery Plan. The aim was to continue the Agency’s work by supporting the efforts of scientific communities to tackle the Covid-19 pandemic within the framework of a global approach and to contribute to knowledge production in all the relevant research areas. “Health, environment, digital technology, social sciences and humanities... The pandemic has consequences for all of society,” Yves Fort emphasises.



Minimising the impact of the crisis on scientific communities

Business continuity planning, staff mobilisation, adapting schedules, accelerating the negotiation of research agreements... All actions taken by the Agency to support researchers. The aim was to enable them to submit their proposals on time and reduce the potential impact of the pandemic on project review, selection and contract agreement.



“We adapted and innovated to accelerate our processes without deviating from our rules, always respecting the project coordinators.”

YVES FORT
ANR'S SCIENTIFIC
OPERATIONS DIRECTOR

Providing continuity of service during the crisis

With the help of a coordination unit, ANR deployed a business continuity plan designed to safeguard the Agency's operations against the developing pandemic. *“All our departments worked hard to minimise the impact of the crisis on scientific communities. Because ANR is above all a set of services for scientific stakeholders,”* Yves Fort reminds us.

Adapting schedules and procedures

To minimise the consequences of the lockdown period and laboratories being forced to work from home, ANR automatically extended all research projects in progress by six months, with no need for additional action by laboratories or their managers. Additionally, the closing dates of open calls for proposals were extended and credits allocated for 2020 that could not be committed due to the pandemic

were carried forward. The timetable of the Agency's flagship programme, the 2020 Generic Call for Proposals (AAPG), was adapted to the constraints of the health situation: the closing date was pushed back nearly two months to May, the time for replying to external reviewers was rescheduled for early July, the review of full proposals was moved from June to September etc. For the first time, to limit the impact of these changes and avoid delaying the projects themselves, the selected projects were announced as they were chosen throughout September and October 2020, as the hybrid-format evaluation panels made their decisions. *“Thanks to the responsiveness of the reviewers, committee members and all the ANR staff, including contract negotiation, we limited the delay despite having to deal with higher workloads due to the three Covid-19 calls for proposals,”* explains Yves Fort. *“The projects selected for the AAPG all began on 1 October.”*

In-house departments step up to the plate

Early health measures, widespread adoption of working from home, support from the health and safety department, reinforced internal communication... Throughout 2020, ANR's teams worked within the organisation to adapt to the new situation. These actions earned the Agency the "Covid-19 health measures" label from AFNOR in March 2021.

A coronavirus work plan

As soon as the epidemic began, in March 2020, ANR adopted a series of measures to ensure its activities could continue while guaranteeing staff safety, consulting with the health and safety team and the Health, Safety and Working Conditions Committee (CHSCT), which was very active. As well as taking steps to prevent the virus from spreading and applying all the safety measures, the coronavirus work plan has regularly been updated and adapted since March 2020 in response to the developing health situation.

Widespread adoption of home working

Due to the government's lockdown measures, working from home was increased to five days a week during 2020. This change was possible thanks to the work of the IT department and the equipment it made available: laptops, headsets, monitors, video conferencing tools etc. To guarantee the best possible quality of communication, particularly during team meetings, and to ensure the evaluation panels could operate smoothly, the Agency's staff received training in the use of these tools. At the same time, taking approval workflows online made remote communication simpler.



“We took very strict precautionary measures in March 2020 to protect our staff.”

PHILIPPE TERRAL
ANR'S HR DIRECTOR



Maintaining links through internal communication and dialogue between management and staff

The Information and Communication Department, the Human Resources Department and the Agency's health and safety team worked closely together to support staff and keep them regularly updated. Fact sheets about staying safe and recognising the symptoms of Covid-19 were produced, and information was regularly distributed via the intranet. Monthly information webinars were quickly set up to provide Agency staff with a regular online meeting place, and attendance at these events was always high. Several online presentations were also given by ANR's science officer, describing the evolution of the epidemic. To combat feelings of isolation, a free phone number offering psychological support was set up. Staff were also able to contact the social worker to discuss financial or personal difficulties. Several surveys were conducted during 2020 to measure the impact of the pandemic and the lockdown on working conditions for staff.

Three tailored calls for proposals to meet new challenges

Encouraging the search for innovative, urgent solutions responding to the evolution of the pandemic.

This was the goal of the three specific calls for proposals opened to scientific communities by the Agency during 2020: Flash Covid-19, RA-Covid-19 and Resilience Covid-19. Together they generated over 1,000 proposals.

“The Agency committed to the epidemic response as far back as February, working with the Ministry of Higher Education, Research and Innovation and the REACTing consortium to mobilise scientific communities around the research priorities identified by the WHO,” explains Yves Fort. The measures deployed by the Agency to tackle the scientific challenges posed by the health crisis included launching the Flash Covid-19 call for proposals between 6 and 23 March, just as the national lockdown was being imposed. Designed to provide rapid responses to urgent research needs, the Flash call has been used several times, including in 2014 during the Ebola epidemic that was raging in Africa. The main benefit of this instrument? *“It enables funding to be put in place via flexible, accelerated processes,”* points out the Scientific Operations Director. The results of the Flash Covid-19 call were published on 10 April, five weeks after the call was published, *“compared with around three months under normal circumstances”*. Average funding of €153,000 was allocated to 115 projects, including 44 that received seed funding of €30,000 provided 48 hours after the call closed. On 16 April, as the pandemic intensified, ANR launched another call: RA-Covid-19. Open continuously until 28 October 2020, it aimed to account better for the diversity of the scientific questions arising as the pandemic

developed and health and economic measures were put in place. RA-Covid-19 was aimed at “research-action” projects with results, methods or techniques that could be implemented in society within three to twelve months. It offered research communities the possibility of submitting projects for six months, with an ongoing review process. This unprecedented call attracted 614 eligible proposals, of which 128 were funded with a total of €14.6 million. Finally, following the resurgence of the pandemic in the autumn of 2020, a third call for proposals, Resilience Covid-19, was launched on 18 December. Open until 2 March 2021, it covered issues associated with the persistence of the pandemic. Favouring multidisciplinary approaches, this call targeted short-term research projects whose results could contribute to decision-making in the field of health or to the management and control of the epidemic and its effects in 2021.



3 questions for...

ANTOINE GESSAIN

SCIENTIFIC EVALUATION PANEL CHAIR

Leading the Epidemiology and Pathophysiology of Oncogenic Viruses unit at the Institut Pasteur, Antoine Gessain chaired the scientific evaluation panel for the Flash Covid-19 and RA-Covid-19 calls for proposals. Interview.

WHY WERE THE FLASH AND RA-COVID-19 CALLS PARTICULARLY SUITED TO THE URGENCY OF THE HEALTH CRISIS?

A. G. As of March 2020, we had very little knowledge about the SARS-CoV-2 virus, its origin, its pathophysiology, preventive measures or the public health consequences of the crisis. There was an urgent need to acquire new information and data in a wide range of scientific fields. In this context, ANR's Flash Covid-19 helped to support 18-month multi- and interdisciplinary research projects in order to provide rapid knowledge in response to the crisis. Meanwhile, RA-Covid-19, the second call, supported projects of three to 12 months with a view to applying the short-term results.

HOW DID YOU CONDUCT PROJECT EVALUATION IN THIS UNIQUE SITUATION?

A. G. The scientific evaluation panel's board was quickly set up and consisted of four members: Hubert Laude, virologist; Laurence Weiss, immunologist; Jean-Pierre



Moatti, health economist; and myself, a virologist. My role was to coordinate the evaluation of the proposals received in order to identify and rank the best research projects. They were evaluated based on the urgency of the scientific question asked, e.g. to identify discoveries or collect biological, epidemiological or sociological data in the context of social science surveys.

WHAT WERE THE CONSEQUENCES FOR PROCEDURES AND THE WORK OF PEER REVIEWERS?

A. G. For the RA-Covid-19 call for projects, the evaluation was carried out as and when projects were submitted, from June to the end of January 2021. The panel met regularly to assess approximately 30 to 40 project proposals per selection round, of which there were 17 in total. Given the large numbers of proposals and the diversity of the scientific questions proposed, significant work was carried out by ANR to identify both external experts and qualified internal reviewers/readers to evaluate the proposals – biostatisticians, ICU clinicians, environmental health researchers, sociologists, health economists etc. The organisation of the panels had to be adapted to travel and meeting restrictions, by holding panel meetings entirely online.

“Responding to an urgent need to acquire new information and data in a wide range of scientific fields.”



Over 270 research projects in total funded in response to the epidemic

279 research projects received total funding of €35.6 million across the three calls for proposals launched by ANR: Flash, RA-Covid-19 and Resilience Covid-19. Often multidisciplinary, covering a wide range of themes, these projects also received co-funding from regions and foundations.

From studying the biology of the virus to developing diagnostic tests and analysing the effects of lockdown on social inequalities and funerary practices, the projects supported by the Flash, RA-Covid-19 and Resilience Covid-19 calls for proposals cover a very wide range of subjects. Designed to mobilise research outside the scientific communities already involved and to produce social and economic as well as epidemiological, pathophysiological and health knowledge, these three calls encouraged immediate scientific responses: within 18 months for the Flash call, within three to 12 months for the RA-Covid-19 call and within 12 months for the Resilience Covid-19 call.

Structuring and coordinating the research

Based on recommendations from the WHO and the REACTing consortium, the scientific fields of the three calls covered all the disciplines likely to provide global knowledge about the epidemic and the conditions of its management, but also about the characteristics of the virus, the disease and potential therapies. The projects involved the biological and medical sciences, social sciences and humanities, mathematics and modelling, along with physical and chemical sciences. The Flash call focused primarily on four themes: epidemiological and translational studies; disease pathophysiology; infection prevention and control; and ethics and social dynamics. The RA-Covid-19 call also covered these four areas as well as a fifth on the global issues of the epidemic, including the macro- and micro-economic impact, working conditions and social conflict, models of the recovery from the health crisis, understanding the factors behind the emergence of the pandemic etc. The third initiative, Resilience Covid-19, aimed to account for new developments in the pandemic, targeting fields little studied in the previous calls, while also extending work on pathophysiology and epidemiology, prevention and control of the epidemic, social dynamics and the economic and organisational impacts on different activity sectors and international relations.

Involving business, professionals and stakeholders

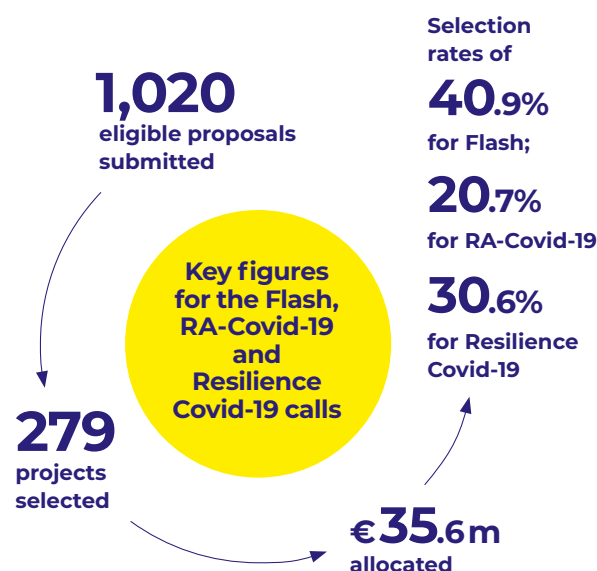
Several projects analysing the effects of the pandemic on marginalised and vulnerable populations surveyed service users, social workers, accommodation centres and volunteers. The effects of epidemic management on healthcare organisation, treatment pathways and the ethical dimensions were

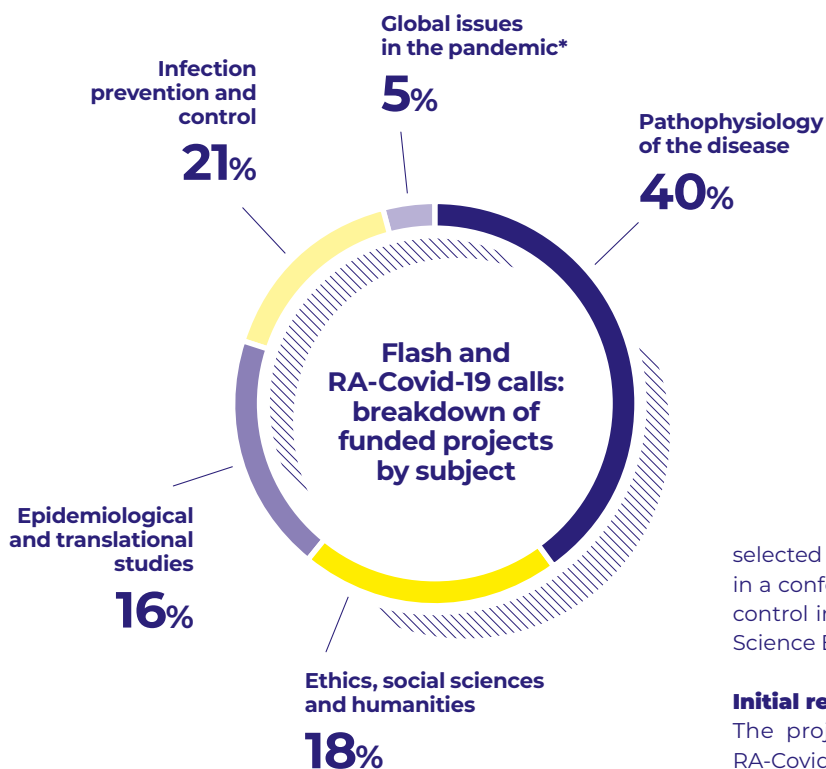
also studied, with the involvement of health professionals and services, representatives of patients' associations and patients themselves. The projects also involved 21 private companies as either backers or partners.

A coordinated response from partners

Around 30% of the budget for the Flash Covid-19 and RA-Covid-19 calls for proposals, amounting to €9.7 million, was contributed by ANR's partners, topping up the emergency funds from MESRI (€16 million) and the Agency's funding (€6.5 million). These co-funders included the Foundation for Medical Research (FRM), the Fondation de France and six regions: Auvergne-Rhône-Alpes, Grand Est, Hauts-de-France, Occitanie, Pays de la Loire and Centre-Val de Loire. They all teamed up with ANR to coordinate actions to support research on the Covid-19 pandemic.

Further afield, the Agency also collaborated with JST (the Japan Science and Technology Agency) on three projects



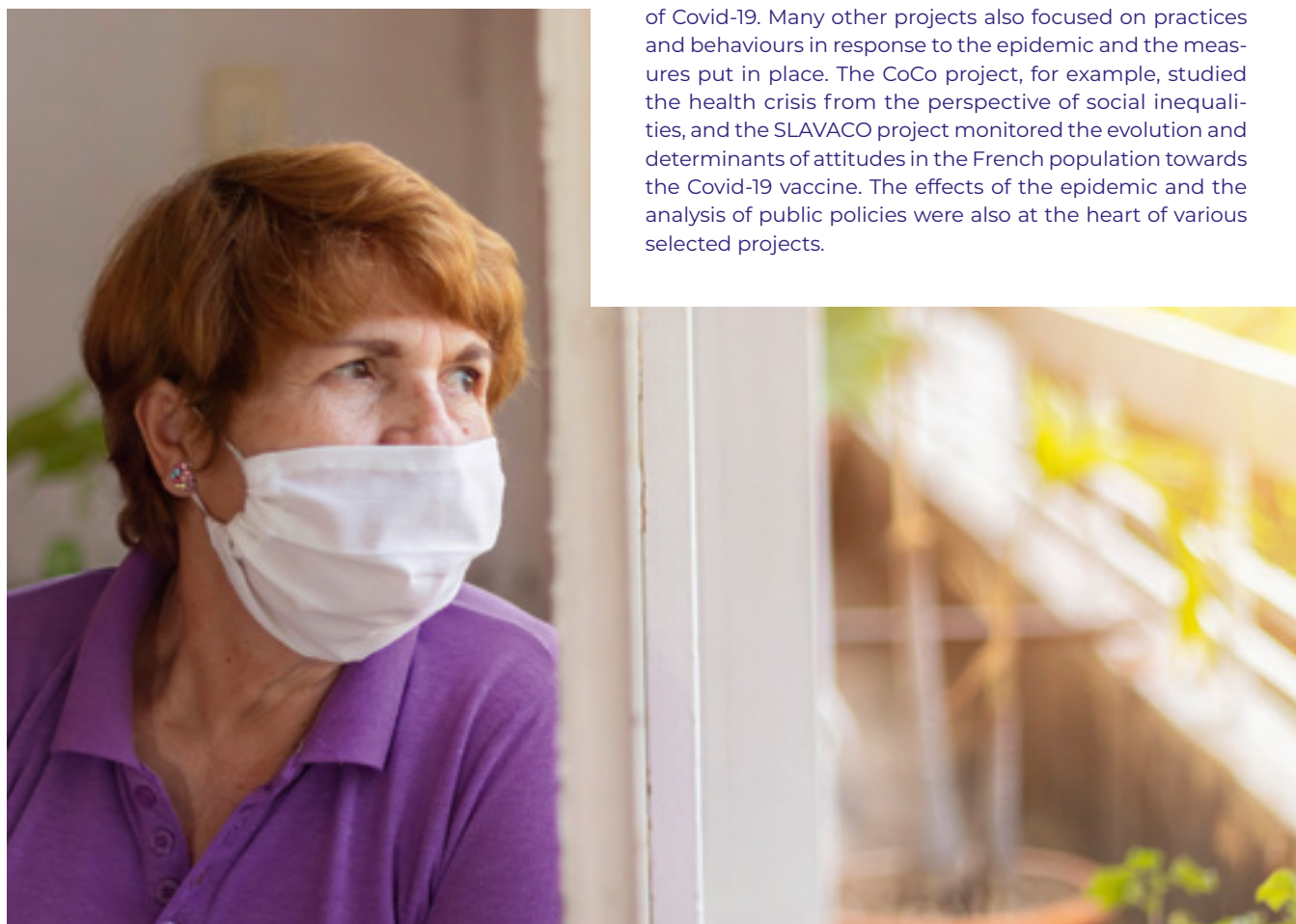


* RA-Covid-19 only

selected for the Flash Covid-19 call. In addition, it took part in a conference on the theme of epidemic prevention and control in association with the Chinese agency NSFC and Science Europe on 14 December 2020.

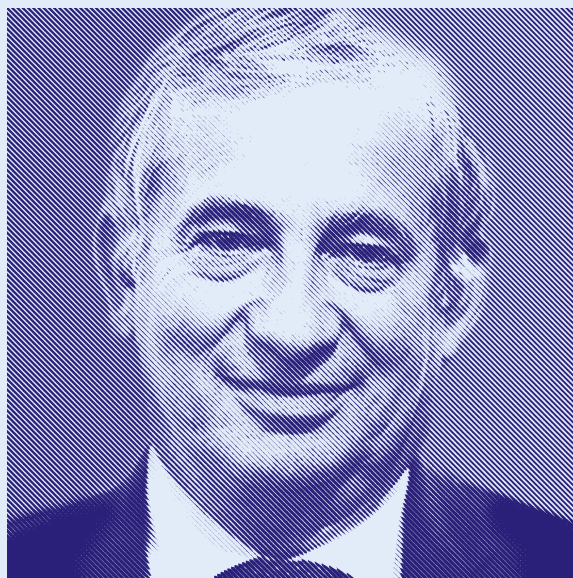
Initial results

The projects funded through the Flash Covid-19 and RA-Covid-19 calls quickly generated results. Around 30 publications arising from 19 projects – and six patents – were in preparation or submitted by December 2020. In summer 2020 the AM-Cov-Path project, coordinated by Roger Legrand (CEA), published two articles in *Nature* and *Nature Communications* on hydroxychloroquine in the treatment of Covid-19. Many other projects also focused on practices and behaviours in response to the epidemic and the measures put in place. The CoCo project, for example, studied the health crisis from the perspective of social inequalities, and the SLAVACO project monitored the evolution and determinants of attitudes in the French population towards the Covid-19 vaccine. The effects of the epidemic and the analysis of public policies were also at the heart of various selected projects.



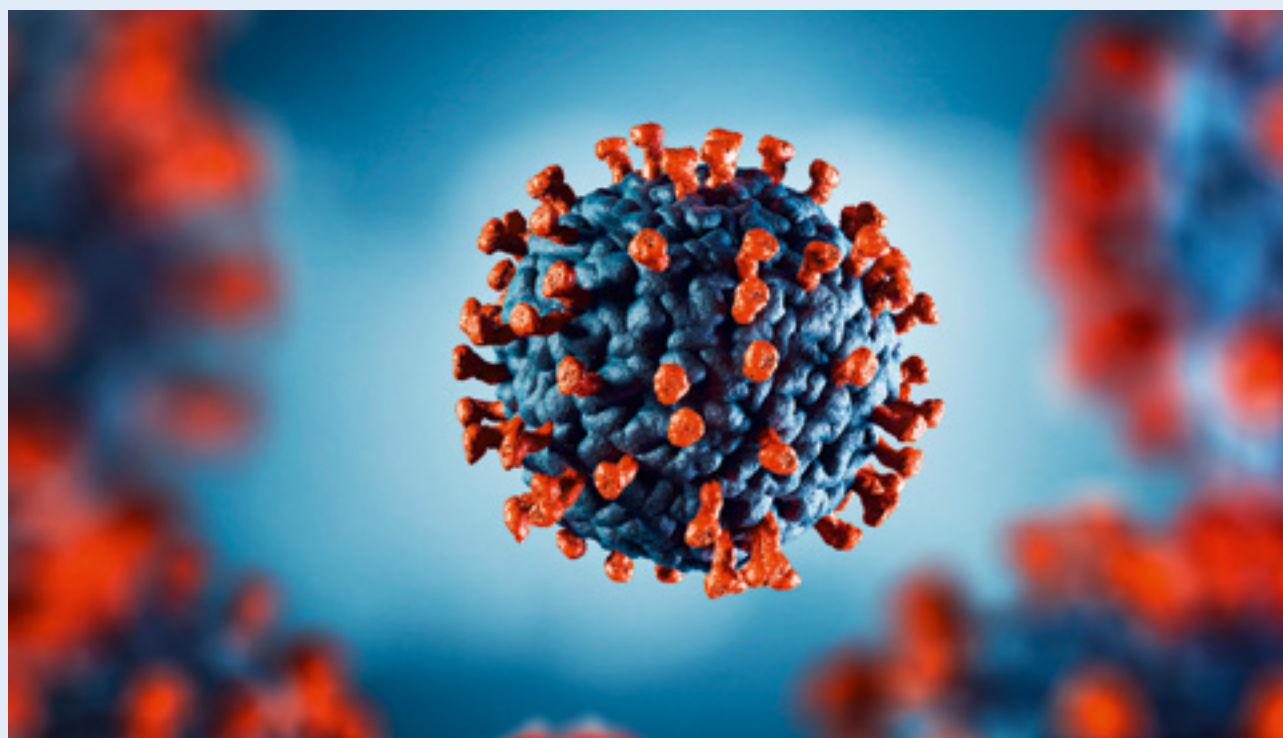
DOMINIQUE DUNON-BLUTEAUHEAD OF ANR'S BIOLOGY
AND HEALTH DEPARTMENT

“Scientific communities and our partners appreciated the responsiveness and innovative nature of our calls for proposals on Covid-19. Science Europe, the association of research organisations and national funding bodies, presented our Flash call as one of the first calls for proposals on Covid-19 to be published and to have generated initial results. An OECD report also welcomed the holistic nature of our calls for proposals: from pathophysiology to the socioeconomic consequences of the health crisis. Vaccine development and clinical research are not included – clinical research is managed by the General Directorate for Care Provision (DGOS) within the Ministry of Solidarity and Health. The crisis has forced ANR to demonstrate unprecedented responsiveness and significantly adapt its procedures. We have managed to start projects just two days after their evaluation, and we were able to announce the results of the Flash



call only two months after it was designed, something that has never been seen before. But new scientific questions have arisen every week as the pandemic has developed – the consequences of “long Covid”, modes of viral transmission, the impact of lockdowns on mental health etc. This was the stimulus for the launch of RA-Covid-19 and then Resilience Covid-19 in order to cover all the possible aspects of the health crisis and put rapid responses in place. Covid has changed the way we work. It has broken down barriers between disciplines and led to the introduction of new tools, such as seed funding and calls for proposals that are open continuously.”

“Our capacity to adapt and innovate has contributed to the responsiveness of French research.”





— FOCUS

DON'T MISS

GENCOVID, “one of the ten most remarkable discoveries of 2020”

Coordinated by the immunologist Jean-Laurent Casanova (Imagine Institute and Rockefeller University), the GENCOVID project built on the COVID Human Genetic Effort, an international consortium, to identify the genetic and immunological factors that may explain the occurrence of severe forms of Covid-19. This work helped to explain that 15% of serious forms of the disease are due to genetic abnormalities, particularly those that reduce the production of type I interferons, which are powerful antiviral molecules in the immune system. Published in *Science*, these results were recognised by the international journal as one of the ten most remarkable discoveries of 2020. They can be used to screen people at risk of developing a serious form of the disease and to treat these patients more effectively.



DON'T MISS

An overview of the 279 funded projects

Virus biology, immune response characterisation, modelling of the spread of SARS-CoV-2, organisation of hospital and care services, medical ethics, analysis of perceptions and behaviours, management measures and public policies – the 279 projects funded by ANR through the Flash, RA-Covid-19 and Resilience Covid-19 calls are all presented in *Covid-19: a panorama of the funded research projects*. This publication, 40 or so pages long, highlights the projects' scientific dynamism in its multiple dimensions and its contribution to fighting the epidemic.

Read the publication:

https://anr.fr/fileadmin/documents/2021/ANR_bilan-covid-23032021.pdf





1

An agency committed to research

Beyond the funding it provides, ANR supports all scientific communities and aims to promote the responsible management of knowledge on behalf of everyone. Scientific integrity is a major issue, and many of the Agency's actions are guided by this priority, including its Open Science policy and its gender equality work plan. These commitments are also reflected in the Investments for the Future (PIA) programmes managed by the Agency and the national plans it implements in areas such as neurodegenerative diseases.

PAGE 28. The ANR Tour: online events for research stakeholders **PAGE 30.** Open science: a commitment to sharing scientific knowledge **PAGE 32.** Gender equality: ANR's commitment via its work plan **PAGE 34.** PIA: Paris Sciences et Lettres and Paris-Saclay universities confirmed as IdEx **PAGE 36.** Supporting the development of artificial intelligence in France and around the world **PAGE 37.** Neurodegenerative diseases: a review of eight years of research



ANR TOUR 2021

Online events for research stakeholders

Due to the health situation, the fifth ANR Tour turned to a unique format in 2020. Designed to inform scientific communities about calls for proposals and the Agency's monitoring tools and funding methods and to provide an opportunity for discussion, these meetings took place online, through a series of around 20 webinars.

A shorter, more interactive format

The Agency has rolled out a new system to ensure the ANR Tour 2021 runs smoothly. Traditionally, the Tour involves about 30 physical meetings throughout France for researchers and institution managers. This year, scheduled from 5 October to 5 November 2020, the events took place virtually as a series of themed webinars. Lasting two to three hours, these presentations involved the Agency teams in a cross-cutting way, as they were led by the scientific operations director, the scientific community relations manager, the heads of the five scientific departments, scientific project managers, programme managers and experts in contract establishment and legal affairs. The researchers and administrative staff from research institutions were invited to learn about and discuss ANR's funding opportunities and its methods for selecting and monitoring projects. These 100%-digital meetings were a great success, with over 3,000 people attending.

Targeted themes and personalised answers

How do you put together and submit a proposal? What measures is the Agency taking in the context of the pandemic? How are ANR grants paid? All these questions were answered during the ANR Tour webinars. The events were divided into multiple sessions on specific themes: the 2021 work plan, GDPR and international collaboration, funding regulations, calls for proposals in the social sciences and humanities, consortium agreements and the new project monitoring tool (see next page). The discussions were a chance for ANR staff to answer directly the questions posed by research stakeholders using a form. An ideal opportunity to discuss and present the Agency's processes and find out more about the selected projects.

“The webinars expand the information provided by the Agency, and the questions asked live enabled us to be more efficient and comprehensive. This positive experience inspires ideas for the future: we will probably offer mixed formats combining face-to-face meetings and more informative webinars in future years. This would help scientists and administrators from regions outside Paris to take part.”

YVES FORT
ANR'S SCIENTIFIC
OPERATIONS DIRECTOR

— FOCUS

8 webinars accessible online

Calls for proposals focused on European and international research, funding conditions, AAPG 2021... Eight themed ANR Tour 2021 webinars are available on the Agency's website as presentations to download or stream.

Find them here:

<https://anr.fr/fr/actualites-de-lanr/details/news/anr-tour-2021-des-webinaires-dinformation-et-dechanges-sur-les-appels-a-projets-les-modalites-d/>



A new tool to improve the monitoring of research projects

A new portal was launched in September 2019 to enable all applicants and recipients of ANR grants to monitor the research projects they are involved in at any time: <https://suiviprojets.anr.fr>. Following registration, it gives project coordinators, principal investigators, administrators and laboratory directors a summary of the project data (excluding detailed scientific documents), from submission until project closure: state of progress, partners, deadlines, installments paid, deliverable tracking etc. Initially tested in early 2020 with eight pilot research institutions and universities, the portal was then rolled out to all recipients, with data supplied and updated via the Agency's digital tools (SIM and/or IRIS). Projects funded through the Investments for the Future programmes are not included, as they have their own monitoring platform. To simplify administration and communication, the tool incorporates a contact form and a user guide is available.



OPEN SCIENCE

A commitment to sharing scientific knowledge

An international priority, free access to research publications and data is now enshrined in France's National Open Science Plan. This is why in 2020 the Agency accelerated its work to make information about funded projects accessible and to promote the practices of open science.

Encouraging free access to research publications and data is the goal of ANR's open science policy, which has been strengthened since 2018 through the National Open Science Plan. In 2020, to reinforce the foundations of this openness still further, the Agency worked on making data about the projects it funds available at data.gouv.fr and developing the HAL-ANR portal in consultation with national and European open science stakeholders (research organisations, the MESRI open science committee, cOAlition S, Science Europe, OpenAIRE etc.). *"We talk to our counterparts to standardise practices,"* explains Martine Garnier-Rizet, head of the Digital and Mathematics department (NuMa) and the Agency's open science coordinator. This is the substance of the joint declaration signed on 29 June by the French research funding agencies.

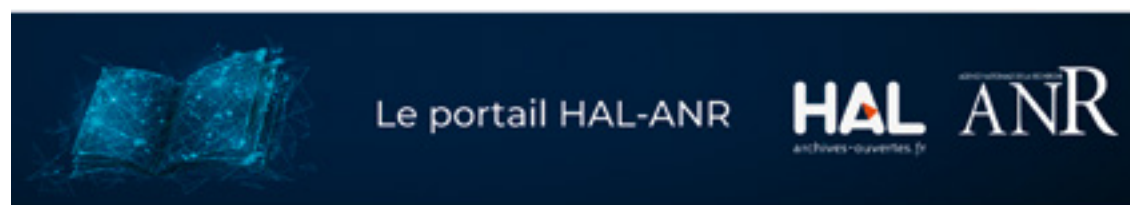
Concrete actions to promote scientific publication

The first measure involves asking all recipients of ANR funding to submit the publications arising from their projects to the HAL-ANR portal. Project review has also been simplified and brought in line with the San Francisco declaration. In particular, project coordinators must provide up to five publications or key projects associated with their research, and only the content will be taken into account – not the reputation of the journal or any associated metrics (impact factor).



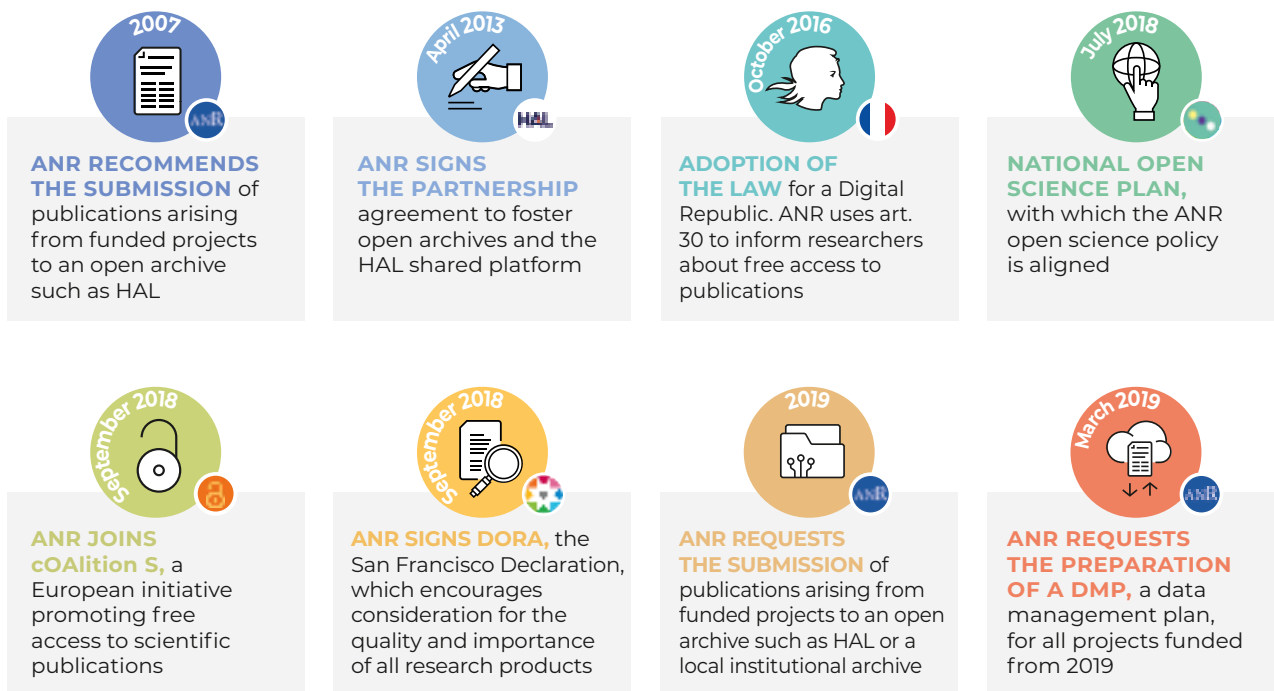
"The principle of open science must benefit the whole scientific community."

MARTINE GARNIER-RIZET
HEAD OF DIGITAL AND MATHEMATICS
AND THE AGENCY'S OPEN SCIENCE
COORDINATOR



ANR'S OPEN SCIENCE POLICY IN 8 KEY DATES

ANR

**Informing project coordinators about data management and sharing**

The Agency aims to raise awareness among funding recipients and encouraging them to adopt best practices in terms of data management, sharing and reuse, in accordance with the Agency's guiding principle: as open as possible, as closed as necessary. Six months after the project is launched, they must provide a data management plan that will be updated throughout the course of the project. "The goal is to promote better data management in order to encourage the reuse of research data. We want to show that these practices should benefit the whole scientific community," explains Martine Garnier-Rizet. The Agency itself is showing the way by opening up the data about the projects it funds, which total 1,200 a year through its Generic Call for Proposals alone and nearly 22,000 since ANR was founded in 2005. Every month, the databases concerning the projects and partners receiving funding are updated with details of the projects in progress (programme, title, summary, coordinator, partners etc.).

HAL-ANR portal: easier access to publications

When it was launched at the end of 2020, the multidisciplinary HAL-ANR portal already contained 30,400 documents from projects funded by the Agency that had been submitted by project coordinators. Developed in partnership with the Centre for Direct Scientific Communication (CCSD), the site enables scientists and other research stakeholders to access the full text of peer-reviewed publications: journal

30,400
documents available
on the HAL-ANR portal
at the end of 2020

articles, books and book chapters, theses etc. Documents can be searched using a variety of criteria: project, programme, organisation, scientific field, date and/or author etc. Interfaced with the data.gouv.fr site, the HAL-ANR portal makes it easier to monitor and promote projects. Accessible to anyone, the tool contributes to the more transparent dissemination of scientific information, as in the case of publications about the fight against Covid-19.

GENDER EQUALITY

ANR's commitment through its work plan

Agency governance and organisation, human resources policy, calls for proposals and research evaluation...

Published in 2020, the Agency's gender equality work plan encompasses every aspect of its activity. Here we look at the measures it includes.

Embedding gender equality in ANR's culture for the long term – that is the goal of the work plan formalised on 4 July 2020 and prepared as part of the European Gender-SMART project (2019–2022) and under the civil service reform law of 6 August 2019. Its actions build on the measures taken by the Agency since 2017 in favour of workplace equality. *"The plan was designed collaboratively through workshops bringing the Executive Committee together with Agency staff,"* explains Laurence Guyard, ANR's scientific community relations manager and equality and scientific integrity officer.

— FOCUS

International Women's Day: an initiative in partnership with Sciencetips

Marking International Women's Day, ANR renewed its partnership with Sciencetips, which aims to democratise access to scientific culture by telling popular science stories in a bi-weekly newsletter. The Agency promoted one of the projects it is funding, SexDiff (2019–2022), which examines the mechanisms of sexual differentiation in the embryo and is coordinated by Marie-Christine Chaboissier, Senior researcher at the Institute of Biology Valrose (CNRS).

Science tips

Conseils Scientifiques à vos amis

Bonjour,
Aujourd'hui : "Masculin féminin"
Où l'on découvre comment est déterminé le sexe.

1988, Angleterre, ingénieurs, Peter Goodfellow et ses collègues s'empressent de débiter les échantillons qu'ils attendaient pour poursuivre leurs recherches.

Les chercheurs s'intéressent à la "détermination sexuelle", soit à l'ensemble des éléments qui déterminent le sexe biologique d'un individu, mâle ou femelle. Ils savent que chez les humains, cette dernière dépend des chromosomes : XX pour les femelles et XY pour les mâles.

Caryotype masculin Caryotype féminin

Les scientifiques sont convaincus qu'il existe sur le chromosome Y un ou des gènes responsables de l'apparition des caractères masculins (testicules, pilosité...)

Cellule Chromosome



“Making consideration for gender equality universal in research projects.”

LAURENCE GUYARD
SCIENTIFIC COMMUNITY RELATIONS MANAGER
AND EQUALITY AND SCIENTIFIC INTEGRITY OFFICER

Reinforcing equality in governance and human resources

The first aspect of the plan underlines the importance of gender equality in the Agency’s governance and culture. With this in mind, the plan was presented to management and staff representatives, and a monthly monitoring committee was set up to examine the issue. Regular external and internal communication campaigns emphasise ANR’s commitment and values relating to this theme. Staff training and awareness-raising programmes, essential weapons in the fight against inequality, are organised in a variety of forms, including information on best practices and self-assessment tests. At the same time, the plan includes measures to move the Agency’s human resources policy towards greater equality. This transformation involves ensuring that recruitment panels are gender-balanced and facilitating progress up the career ladder for women (introducing female mentoring). Gaps between the sexes must also be analysed in more detail on the social balance sheet, particularly in terms of pay. Finally, other measures promote a better work-life balance, emphasising the value of part-time work for both men and women.

Overcoming bias in research funding

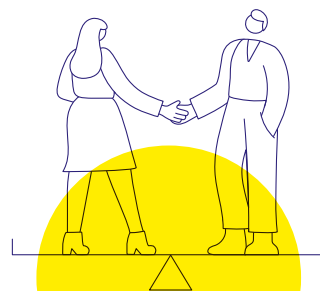
To promote gender equality in research, ANR’s calls for proposals are now written in a way that takes the dimension of sex and/or gender equality into account. To make this practice universal, this dimension must also be taken into account in the evaluation of the projects themselves. This development will follow a test phase that will enable project coordinators to incorporate the new criterion gradually, particularly when writing scientific documents. At the same time, the make-up of the scientific evaluation panels aims for gender parity, though the proportion of women is particularly low in certain disciplines (only 19% in mathematics, for example). Finally, ANR will take steps towards obtaining the Afnor Equality label in 2021–2022 in the deployment of its Work Programme.



— FOCUS

“Gender in research”: a highly attended virtual conference

On 15 December 2020, the “Gender in research” conference took place online, attended by over 500 scientists and institutional players from a variety of research organisations and disciplines. Organised by ANR and Cirad, the day was devoted to gender bias in research evaluation and knowledge production and the consequences and resistance encountered when these approaches are implemented. Following these two themes, a round-table discussion provided an opportunity for dialogue between researchers and evaluation panel chairs to better identify the role of these biases in project evaluation in relation to the inequalities observed in academic careers.



500

participants
in the “Gender in research”
virtual conference on
15 December 2020



INVESTMENTS FOR THE FUTURE PROGRAMME

Paris Sciences et Lettres and Paris-Saclay universities confirmed as IdEx

As the operator of the Investments for the Future programmes (PIA) in the fields of higher education and research, ANR is responsible for organising calls for proposals and for monitoring and evaluating the funded projects. Focus on the “PIA 1 Initiatives of Excellence” action.

The Paris Sciences et Lettres (PSL) and Paris-Saclay Initiatives of Excellence (IdEx) have achieved their goal and were awarded certification by the Prime Minister on 3 November 2020. PSL and Paris-Saclay took advantage of the 12 December 2018 regulation to become experimental public institutions, adapting their organisation to their project and responding to the expectations expressed by the international jury. This strategy led them into the top 50 of the prestigious Shanghai university rankings in 2020: Paris-Sa-

clay in 14th place and PSL in 36th. PSL and UPS thus join the first four IdEx to be confirmed: the University of Bordeaux, the University of Strasbourg, Aix-Marseille University and the Sorbonne University. The ambition of the Initiatives of Excellence programme is to help create world-class French universities, illustrating the attractiveness and excellence of French higher education. The ambition driven by this policy over the last 10 years is now confirmed by these excellent results.

— FOCUS

50 new EquipEx

Within PIA 3, the ESR (large-scale research facilities)/EquipEx+ action is guided by the ambition of giving France the scientific facilities it needs to keep the excellence of its research up to the best international standards, with the aim of supporting new facilities on a national scale.

The action also contributes to the digital transformation of research and innovation by incorporating the developments essential for effective research with state-of-the-art resources. The 50 projects chosen are now entering a phase of dialogue with MESRI and ANR teams to finalise the funding arrangements. Spread across the country, their mission is to keep French research at the best international standards. The resources allocated to these projects total €422 million.



PIA figures in 2020



Funding

- **10 winners of the Priority Research Programme (PPR) “Alternative Approaches to Cultivation and Protection”,** a call for proposals designed to promote the emergence of pesticide-free agriculture.
- **15 projects in the “Hybrid Teaching in Higher Education”** call to strengthen hybrid provision in complete, degree-level curricula while creating new educational resources shared between higher education institutions.
- **11 “Integration and Development of IdEx and ISITE” projects and 14 “Structuring Research-Based Education in Initiatives of Excellence” projects evaluated by the international panel of the “Great Research Universities” (GUR) action.** These calls support universities with the IdEx or ISITE labels in their efforts to transform and to reinforce the impact and attractiveness of their research-based education.
- **6 projects in the “Very High Performance Sport” PPR, round 2.** The results of these translational research projects in the field of athletic performance will be used by French athletes at the 2024 Olympic Games.



Calls for proposals

- **The “Antimicrobial Resistance: Understanding, Innovation, Action” PPR** aims to fund ambitious, large-scale, long-term research projects to support the emergence of diagnostic, preventive and therapeutic innovations and to achieve better use of antibiotics.
- **The ESR (large-scale research facilities)/EquipEx+ call for expressions of interest.**
- **The “Rare Diseases” PPR** supports the best RD projects based on the establishment of high-quality, accessible, interoperable and reusable databases (FAIR data).



Extended projects

- **8 IRTs were extended until 2025.** The French state renewed its support by allocating a further €199.8 million in tranches 3 and 4. In 2023, the fourth tranche of funding can be released for the period 2023–2025 following a review.
- **7 ITEs were extended until 2024,** with an additional €109.4 million allocated by the state.

Econometric evaluation: IRTs and ITEs under the magnifying glass

What benefits have the Technological Research Institutes (IRTs) and the Institutes for the Energy Transition (ITEs) brought to their ecosystems? This question was central to a quantitative study conducted in 2020 by the evaluation firm Technopolis, working with GATELSE and LISIS researchers, on behalf of ANR. They aimed to analyse the research and development effects of the partnerships on the companies that have helped to fund the IRTs and ITEs. Intended for the government and the PIA supervisory committee, the study is also of interest to the European Commission in the context of the DGE’s evaluation of the system of grants for research, development and innovation. *“This is an original approach. It’s still unusual to carry out an econometric study of the impact of research to evaluate public policy,”* emphasises Pierre Moller, ANR’s IRT manager and the study’s supervisor. To carry out the analysis, Technopolis examined the balance sheets, revenues, added value, R&D budgets and patent applications of 723 SMEs and mid-market companies that have jointly funded IRT and ITE projects. The authors then compared them with a representative sample of non-contributing companies using statistical data from INSEE and from MESRI’s statistics service, SIES. The final report sets out the impact of the IRTs and ITEs on the financial, employment and R&D indicators of the contributing companies. Its conclusions include the observation that *“the IRTs and ITEs seem to increase the in-house efforts of the companies that fund R&D projects within these institutes”*.

NATIONAL AI RESEARCH STRATEGY

Supporting the development of artificial intelligence in France and around the world

Funding teaching and research chairs, doctoral contracts, collaborations with German and Japanese partners... In 2020, ANR continued to implement the Artificial Intelligence plan, contributing to the national AI research strategy.

Creating a national network for teaching, innovation and research in artificial intelligence (AI) is the goal of the projects supported by ANR in 2020. Their deployment builds on the calls for projects launched in 2019 as part of France's National Artificial Research Strategy, promoted by the president and based on Cédric Villani's 2018 report "Donner un sens à l'Intelligence Artificielle" (making sense of to artificial intelligence).

A fast-growing network of teaching and research

ANR funded the creation of 43 teaching and research chairs across France in 2020 for a period of four years. They cover a wide variety of themes in line with the specialisations of the institutions concerned: robotics, earth sciences, neuroscience, medicine, security, finance, ethics, language, energy etc. *"These chairs, complementing those of the French 3IA institutes, are part of the network of AI stakeholders which, apart from academic units, includes a wide range of industries and local authorities,"* according to Fanny Lachat, scientific project manager. At the same time, 274 doctoral contracts were signed to co-fund theses at 22 institutions across mainland France. Again, the research subjects represented vary widely (health, transport, defence, environment etc.).

International calls for proposals in artificial intelligence

The results of the trilateral call for proposals launched in 2019 by ANR and its German and Japanese counterparts, DFG¹ and JST², were published in the first half of 2020. Nine high-level projects dedicated to AI were selected, including projects in the fields of robotics and pharmacovigilance. The awardees presented their projects at a virtual kick-off event in November 2020 during the "Human-Centric Artificial Intelligence" symposium. Finally, MESRI and BMBF (the German Federal Ministry of Education and Research) organised a bilateral call for proposals in artificial intelligence

"Creating international links to develop an artificial intelligence ecosystem."

FANNY LACHAT
SCIENTIFIC PROJECT MANAGER

that closed in December 2020. This call was for three- to four-year projects involving French and German education and research institutions and/or industrial partners. With this type of initiative, the Agency creates new international links around shared centres of interest to develop artificial intelligence.



¹ Deutsche Forschungsgemeinschaft e.V.

² Japan Science and Technology Agency.

BIOLOGY AND HEALTH

Neurodegenerative diseases: a review of eight years of research

Following the conclusion of the 2014–2019 national neurodegenerative diseases plan, the ANR Biology and Health department and ITMO NNP shared a review of the neurodegenerative diseases research funded by the Agency between 2010 and 2018. The work was presented during a virtual conference and also set out in a thematic report.

Parkinson's, Alzheimer's, dementia and cognitive decline, Huntington's disease, multiple sclerosis, AMD... Disabling and currently incurable, these neurodegenerative diseases (NDs) represent a major public health challenge. What scientific advances have been made in this field in recent years? The question was at the centre of a virtual conference organised by ANR and the Multi-Organisation Thematic Institute for Neuroscience, Cognitive Science, Neurology and Psychiatry (ITMO NNP). The event included a presentation of the study "2010–2018 Neurodegenerative Diseases Review – ANR", an overview of the ND research funded by ANR. Produced by the Biology and Health department in collaboration with the Agency's Impact unit and ITMO NNP, the review results from work undertaken in 2018. It aligns with the 2014–2019 neurodegenerative diseases plan and aims to inform discussions and thinking in the preparation of future governmental measures.

The study covers 278 ND projects funded by ANR through various calls for proposals (AAPG, specific calls, international calls etc.). These projects represent 630 teams and ANR funding of €110 million. Varying widely, they investigated different NDs (Parkinson's, Alzheimer's, Huntington's etc.) and contributed to preclinical and clinical research while improving professional scientific and medical practice. Altogether, these projects represent 1,179 scientific publications, enabling advances in understanding disease mechanisms, designing therapeutic strategies, improving screening methods and developing medical devices. They have also encouraged the creation of new national and international consortia and convergence between basic, clinical and industrial research.



— FOCUS

ANR report no. 13: “Neurodegenerative diseases: the challenge for neuroscience”

Stemming from the study of 278 projects dedicated to NDs and funded by ANR between 2010 and 2018, this 116-page thematic report explores the societal issues and future challenges identified by scientific communities. It sets out avenues for research and innovation and an overview of 56 scientific projects.

View the document:

[https://anr.fr/fileadmin/documents/2020/
ANR_Cahiers_N13_complet_web.pdf](https://anr.fr/fileadmin/documents/2020/ANR_Cahiers_N13_complet_web.pdf)



2

Responding to the needs of all research

Generic Call for Proposals, LabCom, Industrial Chairs, European and international calls for proposals...

All the programmes implemented by the Agency encourage scientific creativity, from basic research to technology and innovation transfer, on a French and international scale.

Focus on the Agency's funding instruments and their response to the diversity of research, with examples of the projects and strategic partnerships receiving support.

PAGE 40. 2020 Generic Call for Proposals: over 1,200 projects selected **PAGE 44.** Partnership-based research: ANR at the crossroads between academic research and the business world **PAGE 48.** Europe and the world: supporting French research internationally **PAGE 52.** Scientific projects

2020 GENERIC CALL FOR PROPOSALS

Over 1,200 projects selected

ANR's main call, open to all public and private scientific communities involved in French research, **the 2020 AAPG selected 1,229 projects** for total funding of nearly €500 million. These figures represent an increase despite the need to adapt the timetable and procedures due to the health crisis.

Supporting a diverse range of projects

In 2020, the AAPG accounted for 80.6% of the Agency's funding budget for calls for proposals, totalling €499.8 million. Directed towards all scientific communities as well as public and private stakeholders, including SMEs and very small

enterprises, ANR's Generic Call for Proposals supports all kinds of research: basic research, industrial research and experimental development. Its goal is to support a diverse range of projects. Given the health situation caused by the pandemic, the timetable of the 2020 AAPG was adapted to enable scientific communities to submit their proposals within more flexible time scales, accelerate the establishment of contracts the selected projects and retain a provisional timetable for the 2021 AAPG that would be comparable to previous years. The 49 meetings of the scientific evaluation panels took a hybrid form (combining video conferencing with face-to-face meetings), and for the first time the AAPG results were announced as they became available.

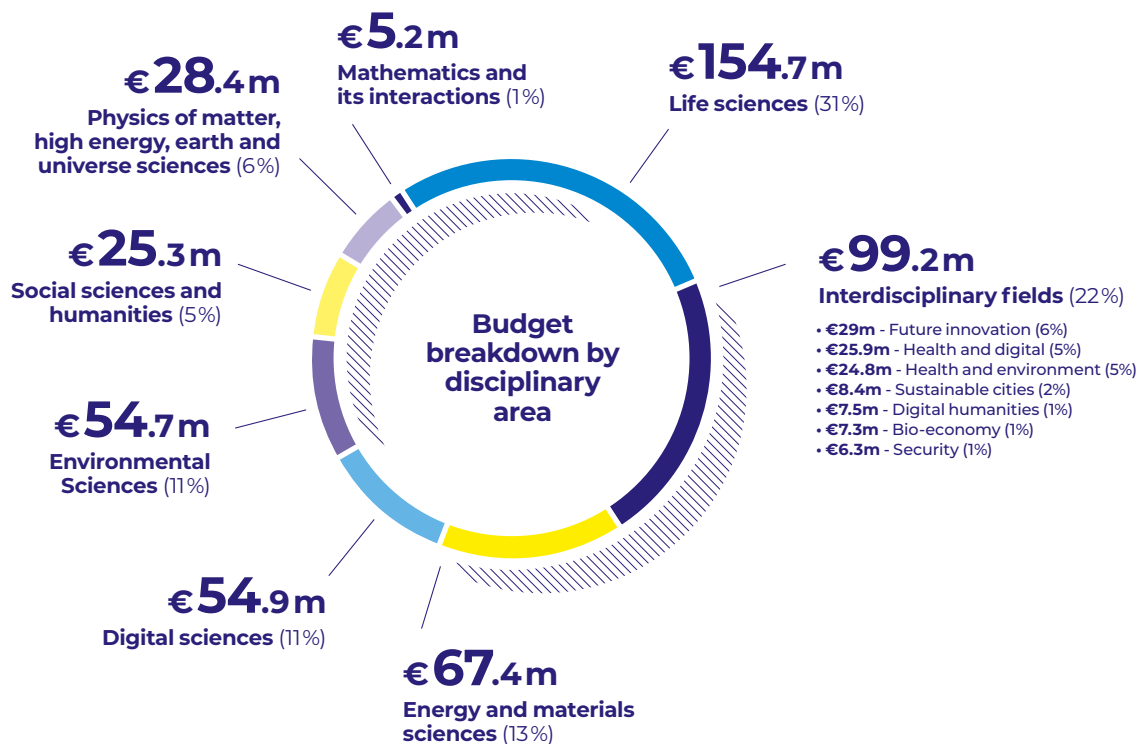
A success rate of 17%

With 1,229 proposals selected from among the 7,234 eligible, the 2020 AAPG has a steadily increasing selection rate: 17%, compared with 16% in 2019 and 15% in 2018. The average grant allocated to each project was 406.7K€. Among the selected projects, 71% involve collaboration between research teams and 29% are coordinated by a young researcher. In addition, 77 projects were selected from the call's supplementary lists, due to budget surpluses arising from project cancellations or delays to third-party programmes, and following the results of the appeal procedure.

Four funding instruments

The AAPG offers four funding instruments, each of which has specific submission and evaluation procedures: PRC (Collaborative Research Projects), JCJC (Young Researchers), PRCE (Collaborative Research Projects involving Enterprises) and PRCI (International Collaborative Research Projects). The first three alone represent 1,128 of the projects selected in 2020 (661 PRC, 353 JCJC and 114 PRCE), 63 more than in 2019, and a total budget of €471.1 million. The selection rate for these three national instruments was 17.1%, compared with 16.2% in 2019.





Breakdown by funding instrument and associated selection rate

Besides these national projects, 101 PRCI projects represent an additional budget of €28.7 million. Over half (55) of these are bilateral French–German projects, jointly funded through a partnership between ANR and DFG (Deutsche Forschungsgemeinschaft), with a total budget of €14.8 million. The other PRCI projects result from collaboration agreements with nine other countries including Austria, Switzerland, Brazil, Canada (Quebec), Hong Kong, Russia and Singapore.

Across all disciplines

Structured into 49 research themes (36 of them within seven broad scientific fields and 13 corresponding to interdisciplinary subjects), the AAPG benefits research teams from all scientific disciplines and all institutions. With 345 projects, 28% of the projects funded, the life sciences are among the best-represented disciplines, ahead of energy and materials sciences (185 projects, 13% of the total budget) and digital sciences (139 projects, 11%).

Support for national priorities and plans

Specific support of €30.3 million was allocated within the 2020 AAPG for the strategic priorities defined by the government and the various national plans that aim to boost research efforts in certain areas. This benefited 51 projects in fields such as artificial intelligence, social sciences and humanities, as well as translational research into rare diseases, antimicrobial resistance and autism within neurodevelopmental disorders.

— FOCUS

Peer review at the heart of the process

All the projects submitted for the AAPG undergo rigorous, competitive selection processes guaranteeing fair treatment, independent scientific peer review and impartiality. This selection is based on the principle of peer review in accordance with international standards. The process is organised through scientific evaluation panels (CES) consisting of French and international scientific figures and the use of external peer reviewers. Specialists in the field involved in the project, these reviewers are invited to contribute by ANR based on proposals from panel members.

▶▶▶



3 questions for...

ANDRÉA DESSEN

A 2021 CNRS silver medal winner and director of the Bacterial Pathogenesis group at the Grenoble Institute of Structural Biology (IBS – CNRS/CEA/Grenoble Alpes University), Andréa Dessen has chaired the AAPG “Characterisation of structures and structure–function relations of biological macromolecules” scientific evaluation panel (CES II) since 2018.

WHAT IS YOUR ROLE AS A CES CHAIR?

A. D. I make sure the projects submitted are evaluated fairly, working with around 15 members appointed by ANR and recognised in their area of expertise, including many foreign scientists. Our first evaluation criterion is the scientific quality of the project, its innovative nature and its objectives. These goals must be clear and must be based on a detailed, relevant methodology. The project’s organisation and societal impact and the complementary nature of the partners are also very important. We all follow the ANR Code of Ethics and Scientific Integrity, based on the main international declarations on the subject such as the San Francisco declaration. We are interested in the project’s intrinsic scientific value, and not on the impact factor of the researchers’ publications, which are not a good predictor of success.

HOW DO YOU SEE THE AGENCY’S EVALUATION PROCESSES?

A. D. Every project is respected. The opinions, work and efforts of the applicants are always considered by scientific figures with varying skills. This collective discussion between peers can sometimes be a challenge, because regardless of the background, experience, nationality and expectations of each panel member, we all have to be at the same level to discuss and share our ideas. ANR organises training for us in the AAPG’s evaluation and selection principles twice a year. This increases our awareness of issues such as parity, gender in selection bias and the prevention and management of conflicts of interest. I have absolute trust in the processes we apply.



“Always scientifically and personally enriching.”

WHY HAVE YOU INVESTED YOUR EFFORTS IN THIS PANEL FOR THREE YEARS NOW?

A. D. Chairing a panel is a different experience every year, but above all it is always scientifically and personally enriching. We see science being done. This feeds into my vision of structural biology, and I am often fascinated by the projects presented because some of them go beyond what has previously been imaginable, such as combining two apparently incompatible technologies to develop a third. This highly unusual year has actually reinforced my convictions: it is urgent and necessary to invest collectively in the sciences to gain a better understanding of infectious diseases and natural processes in general.

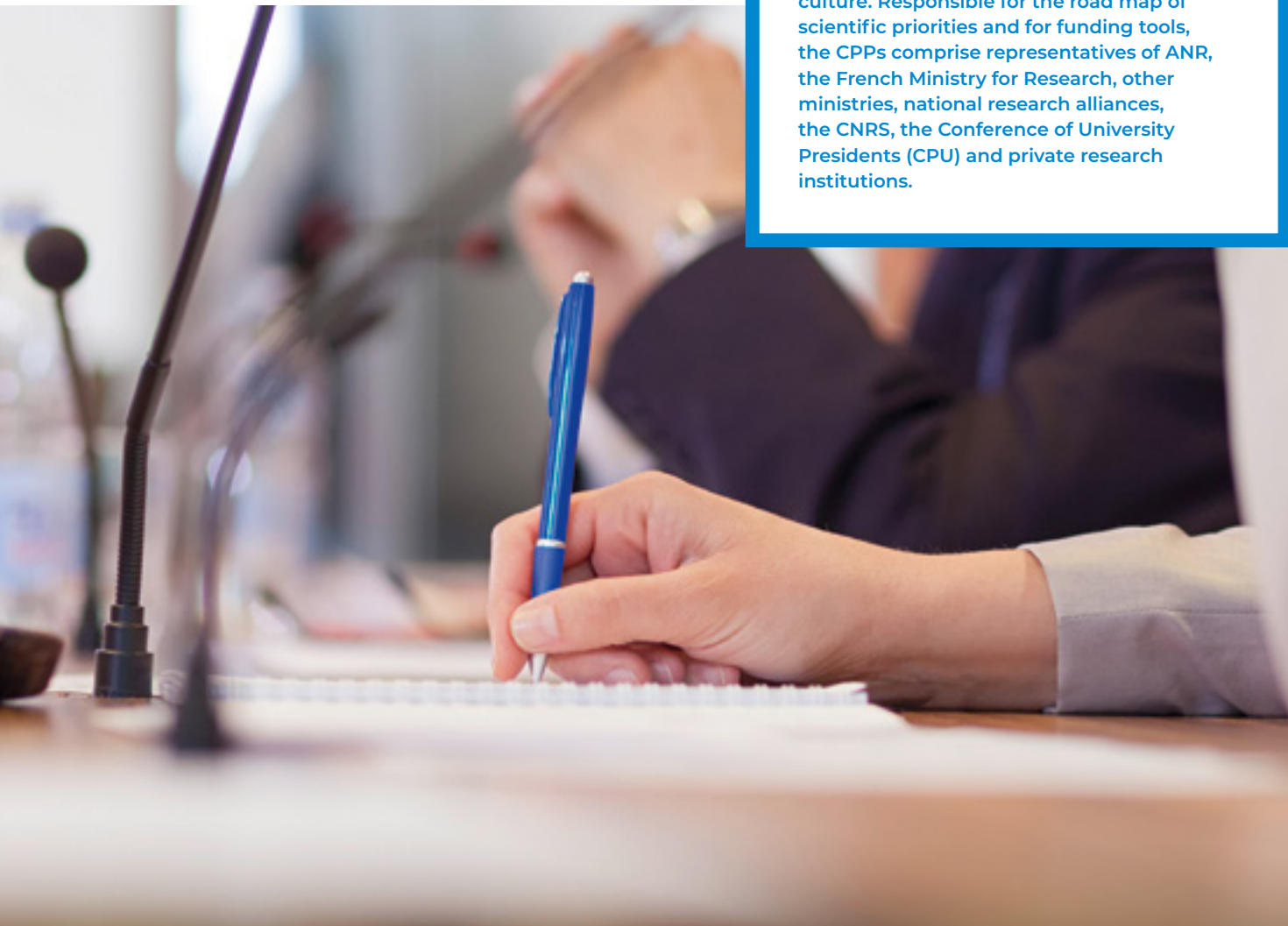
Two-stage selection, certified processes

Two stages structure the AAPG's project selection process. Project coordinators first submit a pre-proposal that is evaluated in terms of quality, scientific ambition and organisation by the scientific evaluation panels (CES). The selected coordinators are then invited to present a full proposal, which is analysed by external peer reviewers and then once again by the CES. This second evaluation covers aspects such as the quality of the project's construction, its originality, its impact and its potential benefits. It involves at least two peer reviews sent to the scientific coordinators during the right-of-reply phase. After collective discussion, the panel ranks the best projects on a primary list and drafts a supplementary list of projects to be funded if co-funding is available or if budgets are reallocated. From receipt of the first proposals to the agreement of contracts for the selected projects, all the stages take place in a context of continuous improvement for ANR's project selection processes, which have been awarded ISO 9001 certification by Afnor since 2018.

— FOCUS

The programming advisory panels prefigure future Work Programmes

During 2020, institutional research stakeholders came together on seven programming advisory panels (CPPs) to define the outlines of the Agency's future Work Programmes (2022–2024). Their thinking covered subjects such as the interdisciplinarity and interconnectedness of scientific areas, reducing potential gender bias in evaluation processes and the promotion of scientific and technical culture. Responsible for the road map of scientific priorities and for funding tools, the CPPs comprise representatives of ANR, the French Ministry for Research, other ministries, national research alliances, the CNRS, the Conference of University Presidents (CPU) and private research institutions.



PARTNERSHIP-BASED RESEARCH

ANR at the crossroads between academic research and the business world

Promoting innovation and working with French businesses to support technology transfer are core components of ANR's purpose. To achieve them, the Agency has several funding programmes designed to develop public-private partnerships: the Carnot Institutes, Astrid and Astrid Maturation, LabCom and the Industrial Chairs.

LabCom, driving innovation in SMEs and mid-market companies

The LabCom call for proposals targets the creation of long-term partnerships between research institutions and small or medium-sized enterprises (SMEs) and intermediate-sized enterprises. Through the joint construction of shared laboratories, the programme supports innovation in industrial

companies. Here we focus on one of them, DESTINS, the first French LabCom dedicated to social innovation. Taking a new look at social innovation – that is the ambition of the DESTINS LabCom, which applies the dynamism of businesses, society and regions to social innovation.

— FOCUS

Social innovation: the ambition of the DESTINS LabCom

Taking a new look at social innovation – that is the ambition of the DESTINS LabCom, which applies the dynamism of businesses, society and regions to social innovation. Opened on 24 January 2020, this shared laboratory brings together the Maison des Sciences de l'Homme et de la Société (MSHS) at the University of Poitiers and Ellyx, a co-operative social innovation start-up in Poitiers. *"In our programme, the aim is to design social innovation as a product of a dynamic that combines [...] economic, social, legal, political and technical solutions produced both locally and nationally,"* explains Meri Reale, a director at Ellyx. The purpose of DESTINS is to encourage the emergence of projects, public policies and services able to respond more strongly to the social, economic and environmental

challenges of the 21st century, such as the ageing population, the ecological transition and mobility. *"This LabCom constitutes a methodological guide to understanding emerging phenomena in French society, thanks to an interdisciplinary approach that brings together a team of innovators and researchers in economics, human geography, management and legal science,"* adds Dominique Royoux, a researcher at MSHS in Poitiers and co-director of DESTINS. The partners coordinate their work around four themes: the ecological transition, issues of dependency and isolation, new modes of learning and shared uses. They intend to develop new investigative and analytical methods, legal and economic tools, support mechanisms for public policies and innovative training courses for social science students.

— FOCUS

39 Carnot Institutes certified in 2020 to strengthen partnership-based research



La recherche
pour l'innovation
des entreprises

On 7 February 2020, the Ministry of Higher Education, Research and Innovation announced the certification of 39 Carnot Institutes. Operated by ANR, this programme recognises high-level research institutions carrying out work in collaboration with the commercial world. Over €5 billion in revenues, 12,356 patents submitted and 1,474 companies created with total state investment of €861 million – the balance sheet of the Carnot Institutes programme since its creation in 2006 is impressive. *“In terms of getting maximum benefit from research, there is nothing better in France,”* declares Jean-Michel Le Roux, who manages the Carnot programme at ANR. A label of excellence awarded every four years by the Ministry of Higher Education, Research and Innovation (MESRI), the Carnot Institutes programme recognises public research institutions involved in bilateral research contracts with companies. Its goal is to accelerate the transition from research to innovation and increase technology transfer to the business world. *“The ambition is to develop corporate trust in research centres,”* clarifies Jean-Michel Le Roux. On 7 February 2020, the Ministry of Higher Education, Research and Innovation certified 39 Carnot Institutes, including one new entry, Assistance Publique – Hôpitaux de Paris (APHP), the university hospital for the Paris region. Under the authority of institutions such as INRAE, Inserm, CEA, CETIM, CNRS and Cerema, the laboratories with the Carnot label work on research areas as varied as low-carbon energy, health, agri-food, optics, microelectronics and embedded IT. *“Today, over 35,000 researchers are involved in Carnot institutes. They work with companies of all sizes and produce research at a TRL¹ of around 3, 4 and 5.”* Once they have received the Carnot

label, organisations benefit from a financial contribution calculated on the basis of the volume of the contracts signed with their socioeconomic partners. The Carnot Institutes fulfil strict selection criteria: *“a well-defined, stable scope with strong thematic coherence targeting a specific market”, “a high level of professionalism in relationships with businesses”, “effective in-house research activity” and “strong governance”.* *“Above all, they must have a well-defined strategy on bilateral contractual research,”* summarises the programme manager.

“Today, over 35,000 researchers are involved in Carnot institutes. They work with companies of all sizes and produce research at a TRL¹ of around 3, 4 and 5.”

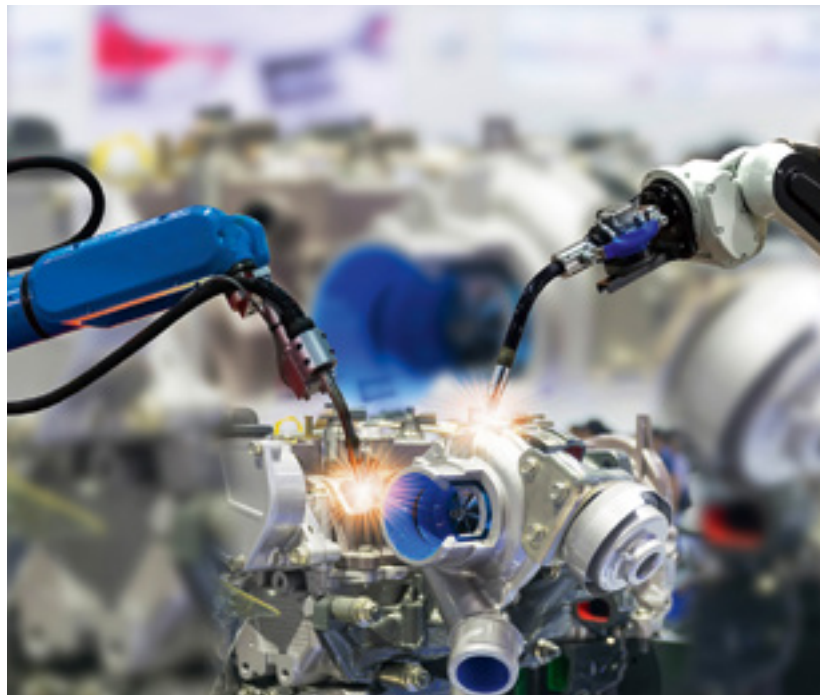
JEAN-MICHEL LE ROUX
ANR'S CARNOT PROGRAMME MANAGER



¹ The nine-point TRL (Technology Readiness Level) scale evaluates the maturity of a technology up to the stage of industrial production.

▶▶ Industrial chairs: innovative, long-term collaborative responses

Held by researchers or teacher-researchers with international reputations, either French or foreign, industrial chairs are a means of structuring collaborative work in strategic priority areas over four years. Collaborating with French companies, they provide innovative responses to industrial problems. **Five chairs were funded by ANR in 2020, including two devoted to materials: MISU and TOPAZE.**



— FOCUS

MISU: modelling the integrity of machined surfaces

Inaugurated on 5 February 2020, the MISU Industrial Chair brings together the Tribology and System Dynamics Laboratory (LTDS – a CNRS mixed research unit), ENISE (the national engineering school in Saint-Étienne) and five French companies: AIRBUS, ESI Group, Cetim, Framatome and Safran. Led by Frédéric Valiorgue, assistant professor at LTDS, the MISU chair aims to achieve a scientific, technological and industrial leap forward in the field of predicting the lifetime of materials following machining processes. The goal of the MISU partners is to develop a complete industrial solution in the form of a commercial software suite able to predict the state of residual stresses, for use by any industry interested in optimising the fatigue resistance of its mechanical components (automotive, medical prosthetics, aeronautics, nuclear safety etc.). They also aim to create new prediction models for complex machining operations (drilling, boring, milling). Total investment: €1.3 million.

TOPAZE: optimising the microstructures and mechanical properties of aeronautical alloys

“Receiving ANR’s approval for two consecutive industrial chairs is a great gift,” said a delighted Nathalie Bozzolo, lecturer in physical metallurgy at the Centre de Mise en Forme des Matériaux (CEMEF), at the launch of the TOPAZE Industrial Chair on 10 February 2020. Having coordinated the OPALE Industrial Chair, she is now leading TOPAZE. A partnership between CEMEF (MINES ParisTech/CNRS), the Institut P’ (CNRS/ISAE-ENSMA/University of Poitiers) and the aeronautical company Safran, this industrial chair builds on the fruitful work of OPALE in optimising the properties of new polycrystalline superalloys based on nickel. Able to withstand higher temperatures in use, these materials help to optimise the efficiency of aircraft engines and reduce their environmental impact. The TOPAZE programme focuses on two areas: the evolution of microstructure during shaping operations and the impact of microstructure on life expectancy in service. The Chair is receiving funding of €1.4 million.



Astrid and Astrid Maturation
projects with a budget
of €9.3 million

Astrid and Astrid Maturation: stimulating dual-purpose research

Managed by ANR on behalf of the French Defence Innovation Agency (AID), the Astrid (specific support for defence research and innovation) and Astrid Maturation programmes respond to the research needs of the French Armed Forces Ministry and support dual-purpose research projects with both civilian and military benefits. Astrid aims to stimulate new avenues for research (TRL 1 to 4), while Astrid Maturation is designed to take projects through the concept validation stage in the laboratory (TRL 4+) and develop an initial prototype. The goal of both programmes is to support innovation efforts on subjects of interest to defence: information engineering, robotics, fluids, acoustic and radio waves, nanotechnology, photonics, materials, biotechnology, geoscience etc. In 2020, 31 projects were funded by the two programmes with a total budget of €9.3 million.



— FOCUS

Spotlight on quantum technologies

CARDAMONE, CoQuIA, QPEG and SoLuQS are the four research projects selected through the Astrid thematic call for proposals covering quantum technologies, launched by the Agency in July 2020. Lasting 18 to 36 months and funded with €300,000 each, they have several objectives: studying *“the advantages and limitations of quantum sensors using Rydberg atoms”*, optimising *“the effectiveness and robustness of laser separators in atomic interferometers”*, developing *“a new type of algorithm able to simulate hundreds of quantum bits”* and establishing *“a secure space-ground communication link for future satellite projects”*. Selected from among nine applications, these four projects target the three areas identified in the call for proposals: sensors, algorithms and cryptography/communications. In line with the national strategy on quantum technologies, this Astrid thematic call should promote the emergence of breakthrough technologies, like the European Quantum Technology programme.

EUROPE AND THE WORLD

Supporting French research internationally

In Europe and worldwide, French researchers are involved in scientific collaborations with teams from all over the world. Encouraging and strengthening these collaborations is one of ANR's missions.

The Agency deploys funding instruments aligned with the strategies of national stakeholders and international initiatives: **PRCI, bilateral and multilateral calls for proposals, as well as MRSEI and T-ERC with a European focus**. Their goals are to open up research spaces without borders, build scientific partnerships around the major challenges of human knowledge, provide joint responses to global problems and support French participation in European research. Structured into themes, the following pages illustrate the strategic partnerships and international collaborations entered into by French teams in 2020 with the Agency's support.

Acting to protect the environment: a global challenge

Finding innovative solutions for fair and sustainable use of the oceans and minimising the effects of climate change.

That is the ambition of the Collaborative Research Action (CRA) Transdisciplinary Research for Ocean Sustainability launched by the Belmont Forum in collaboration with the Future Earth network and the JPI Oceans. Complex and global in scale, this challenge illustrates the need to put together collaborations that span both national and disciplinary borders. This is why the projects selected in this call combine researchers from the natural sciences and the social sciences and humanities alongside society's other marine stakeholders (decision-makers, resource managers etc.). Six consortia selected under this call included French partners funded by ANR in 2020. Dedicated to understanding climate change, the Belmont Forum is an association of international research organisations, joined by ANR in 2012, as a member. In this context, it also took part in a second transnational call in 2020 in association with nine other funding bodies: the Resilience in Rapidly Changing Arctic Systems call.

ANR took part in a second transnational CRA in 2020 in association with nine other funding bodies: the Resilience in Rapidly Changing Arctic Systems call.



— FOCUS

HIT: a French–Singaporean international collaborative research project for quantum technology

Laying the groundwork for the use of new ion trap geometries and contributing to the development of large-scale quantum computing – that is the ambition of the HIT international collaborative research project (PRCI). Involving the Materials and Quantum Phenomena laboratory (CNRS UMR – University of Paris) and the NTU School of Electrical and Electronic Engineering in Singapore, the project has been allocated ANR funding of €555,422. Part of the AAPG, PRCIs initiate or reinforce bilateral collaborations between French and foreign research teams. In 2020, this instrument provided co-funding worth €28.7 million to 101 projects alongside 10 other countries: Germany, Austria, Luxembourg, Switzerland, Brazil, Quebec, Singapore, Taiwan, Hong Kong and Russia.

Systems call. French teams are involved in three projects aiming to achieve a better understanding of the seven elements of Arctic resilience. ANR is also a member of the BiodivERSA network. Alongside 34 funding bodies representing 26 countries, the Agency funded eight projects through this network and the BiodivClim ERA-NET in 2020. The goal of this Horizon 2020 funding is to support the development of international collaborative projects on the theme of biodiversity and climate change.

Digital sciences: a sector with strong economic potential and significant sovereignty issues

A new trilateral French–German–Japanese call on artificial intelligence (AI) attracted 36 proposals. Reflecting a dynamic collaboration, this result also illustrates the importance of this emerging subject, which is considered a priority by all



three countries. The call for proposals launched in 2020 was based on shared values: developing ethical and responsible AI research to strengthen trust, transparency and fairness in AI methods while improving their performance. Following the joint evaluation process, nine projects were selected to receive financial support of over €7 million, including €2.4 million from ANR. They cover a variety of themes, including human–robot interaction, machine learning and AI for manipulating complex objects. Another priority subject covered by an international call for proposals in 2020 was cybersecurity. Aiming to develop high-performance research in this field, which is of great importance for their sovereignty, France and Germany launched a bilateral call for proposals to support top-flight research collaborations between researchers in the two countries. The goal is to develop highly innovative solutions to protect privacy and IT security. Eight projects were selected out of the 17 submitted. Their aims include deploying connected objects with a high level of confidentiality, a system to ensure privacy in the automotive field and a secure, user-centred cancer research platform. Besides, ANR funded 12 projects in 2020 as part of the country's national contribution to the EuroHPC¹ joint undertaking, including four coordinated by French partners, with a total grant of €3.98 million. Founded in 2018, EuroHPC aims to coordinate the efforts and pool the resources of 32 countries with the objective of deploying supercomputers able to perform more than one billion operations per second and reinforce the European knowledge base in HPC technologies. Known by names such as Lumi, Karolina or Vega, the seven European supercomputers under development are essential tools in the response to complex challenges such as creating new drugs, designing new materials for the aeronautics industry and modelling climate phenomena on a global scale.

¹ European High Performance Computing Joint Undertaking.

►► Health without borders

Medicine and biology are fields in which there are many calls for international collaborations. In 2020, ANR funded 11 calls for proposals designed to improve our knowledge of diseases, develop therapeutic approaches or form networks of researchers. These calls primarily target neurodegenerative diseases, rare diseases and antimicrobial resistance, but nutrition, nanomedicine, cardiovascular disease and personalised medicine are also included. A priority topic for France and Germany, antimicrobial resistance is a global threat. To face this challenge, the two countries launched a joint call for proposals for the second year in a row. The call identifies two priorities: developing research into antimicrobial resistance in environmental reservoirs and into antibiotic-resistant bacteria colonising humans, farm animals, pets and food products. The 10 multidisciplinary projects selected involve researchers in human and veterinary medicine, biology, chemistry and agricultural and environmental science. Overall funding amounts to €7 million. France is also involved in the fourth JPI AMR (Antimicrobial Resistance) call for proposals from networks in order to establish groups of experts to design and apply activities to support research into antimicrobial resistance. Another high-priority health theme is rare diseases. Since 2019, this theme has been



calls for proposals designed to improve our knowledge of diseases, develop therapeutic approaches or form networks of researchers.

— FOCUS

Contributing to the urban mobility of the future

The transnational Urban Accessibility and Connectivity (EN-UAC) call for proposals, launched as part of the ERA-NET Cofund of the same name and coordinated by ANR, brought together 22 financial partners from 15 European countries. Out of 86 proposals submitted, 15 projects were selected, three of them involving French teams. Their mission is to develop an urban transport and mobility system that is reliable, safe, fair and affordable for all with a low environmental and health impact. The selected projects focus on urban planning, digital connectivity and acceptability for users. EN-UAC is part of the strategic research and innovation agenda of the Joint Programming Initiative (JPI) Urban Europe.



supported by the European Joint Programme (EJP) on Rare Diseases, which succeeded the ERA-NET E-Rare. Launched in 2020 and supported by 24 countries, the programme's second call for proposals encourages transnational preclinical research projects to develop effective treatments to fight rare diseases. A challenge for neuroscience, neurodegenerative diseases were the subject of three international calls in 2020. Entitled COEN (Centres of Excellence in Neurodegeneration), the first promotes productive transnational collaborations between researchers who are members of centres of excellence (COEs) such as BIND in Bordeaux or GREEN in Grenoble. Seven projects involving French partners were selected. The second call, ERA-NET NEURON, resulted in the funding of seven more projects involving French researchers on sensory system disorders of neural origin. Finally, the third call, ERA-NET JPCofUND 2, focused on developing and improving methods and techniques for imaging and cerebral stimulation for neurodegenerative diseases. Five projects with French partners were selected.

Towards adaptive, reflective, inclusive societies

The atmosphere created by (counter-)terrorism in European cities and the integration of artificial intelligence into our societies are the subjects of two of the eight projects co-funded by ANR through the sixth ORA (Open Research Area for the Social Sciences) call for proposals. Based on an agreement between France, Germany, the UK and the Netherlands, now open to Canada and also involving Japan, ORA has funded over 60 high-quality collaborative projects in all social science disciplines over its first five funding rounds. The more specific Conservation, Protection and Use call investigates the changes that affect our cultural heritage and their impact on how society experiences, appropriates and values this heritage. Launched by the Joint Programming Initiative on Cultural Heritage (JPI-CH), this call aims to fund research into strategies, methods and tools for preserving and using the physical components of our cultural heritage. The five projects supported by ANR in 2020 include investigations on sustainable practices for protecting and conserving landscapes, biological archaeology and ancient lakeside cities on stilts. Five further projects involving French

“ORA: over 60 high-quality collaborative projects in all social science disciplines.”

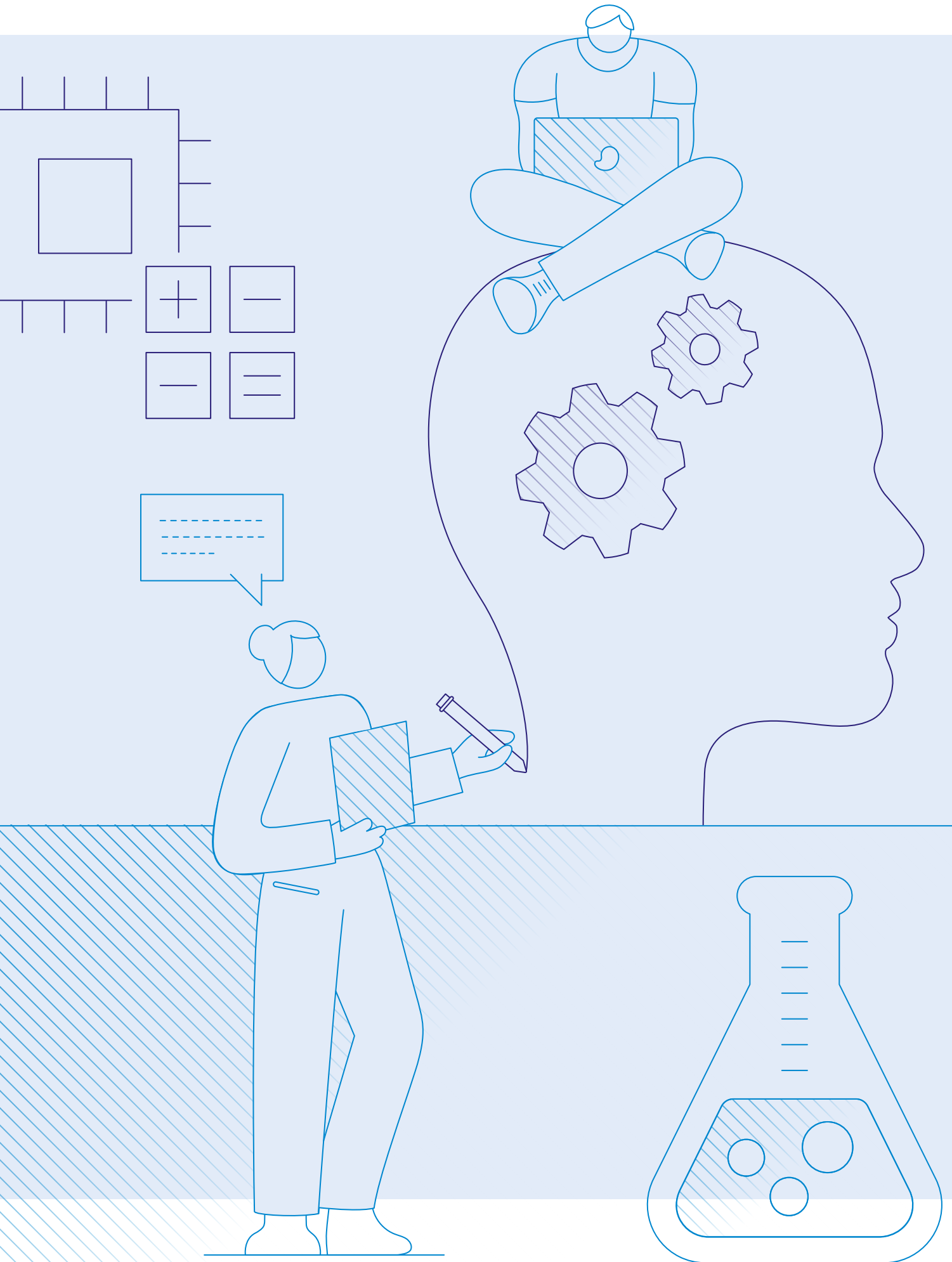
teams were selected for the Democratic Governance in a Turbulent Age call launched by the NORFACE network (New Opportunities for Research Funding Agency Cooperation in Europe) in 2020 with support from the European Commission. The ambitions of the selected researchers include examining how European states can develop strategies to improve the quality of political systems and democratic governance.

— FOCUS

France strengthens its support for the African continent

In April 2020, ANR and the French Development Agency (AFD) launched the Partnerships with African Higher Education (PEA) call for proposals. Funded as part of the Welcome to France strategy, the call has three goals: strengthening African institutions with high-quality education meeting the needs of the business world; creating partnerships between French higher education players and their African counterparts; and encouraging mobility for students and teaching staff. Each partnership project must target one or two education programmes, from bachelor to doctorate level, or one multidisciplinary programme, and involve a sector of activity relevant to the country's sustainable development. In cooperation with the Algerian Ministry of Higher Education and Scientific Research, ANR also coordinates the Long-term Europe Africa Partnership on Renewable Energy (LEAP-RE). An initial transnational call for research and innovation proposals in the field of renewable energy in Africa has been launched. The results are expected by the end of 2021.

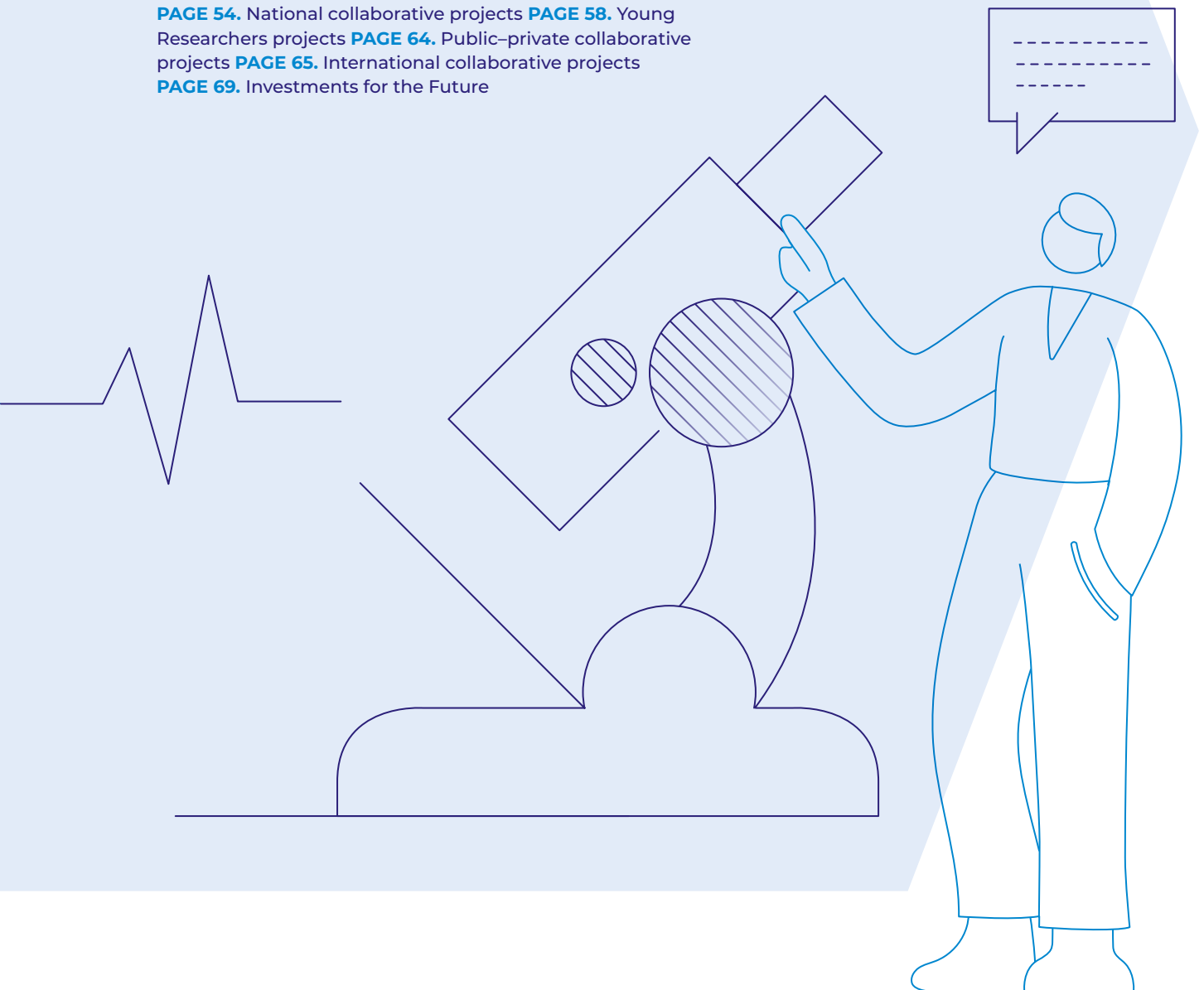




Scientific projects

Conducted by collaborative teams, public–private partnerships or young researchers, or through European or international collaborations, the projects supported by ANR cover a wide variety of scientific fields. Here is a selection of 18 projects finalised in 2020.

PAGE 54. National collaborative projects **PAGE 58.** Young Researchers projects **PAGE 64.** Public–private collaborative projects **PAGE 65.** International collaborative projects **PAGE 69.** Investments for the Future

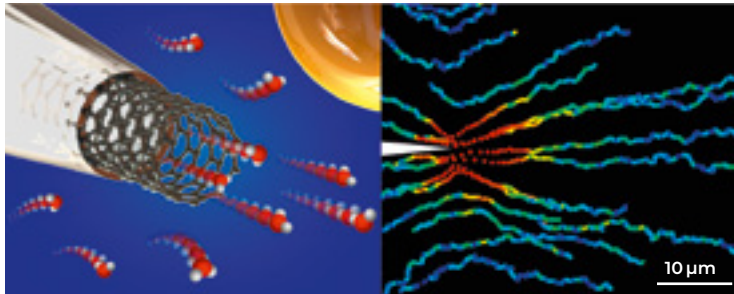


**NANOSCIENCE • FLUID PHYSICS
NANOFLUIDICS • ENERGY • DESALINATION**

BlueEnergy

Osmotic power: nanofluidics for a breakthrough technology

Osmotic power involves harnessing the entropy of mixing, such as the mixing between seawater and river water in estuaries. This completely renewable, non-intermittent source of energy has a global capacity estimated at 2 TWh, the equivalent of nearly 2,000 nuclear reactors. But the limited efficiency of the usual membrane technologies represents an obstacle to its development. However, several recent discoveries have shown that alternative methods exist: sometimes surprising fluid transport processes on the nanometre scale are at the heart of the energy conversion. This is the direction in which future technological breakthroughs must be sought to develop innovative membrane systems. By pushing back the frontiers of basic knowledge about fluid transport at the nanoscale, BlueEnergy has identified new nanomaterials for osmotic power, achieving conversion levels never seen before.



The study of fluid transport through single nanochannels shows that the world of flow on very small scales obeys its own laws, where hydrodynamics comes up against the quantum properties of matter. These fundamental properties pave the way for new energy and desalination technologies.

© L. Bocquet et al., CNRS & École Normale Supérieure, Paris



PERSPECTIVES

Recent discoveries in nanofluidics open up new avenues for the fields of energy and water. BlueEnergy's results show that considerable progress for osmotic power is now within reach, potentially leading to a viable energy source for the future. This is the ambition of Sweetch Energy, a start-up founded in 2017 based on the proof of concept of these new approaches to energy recovery.

Blue Energy: Osmotic power: nanofluidics for a breakthrough technology

ANR programme: AAPG

Edition, project duration: September 2014, 48 months

ANR grant: €523,536

Coordinator: Lyderic Bocquet · Lyderic.bocquet@ens.fr

Project website: <https://www.phys.ens.fr/~lbocquet/>

Coordinating entity: Laboratoire de Physique Statistique, ENS

Project region: Île-de-France · Auvergne-Rhône-Alpes

Publication or main contribution: *Massive radius-dependent flow slippage in carbon nanotubes*, Eleonora Secchi, Sophie Marbach, Antoine Niguès, Derek Stein, Alessandro Siria, Lydéric Bocquet, Nature 537 210 (2016)

Partners:

- ▶ ILM-CNRS Institut Lumière Matière-CNRS
- ▶ ENS Laboratoire de Physique Statistique
- ▶ Liphy - UJF Laboratoire Interdisciplinaire de Physique

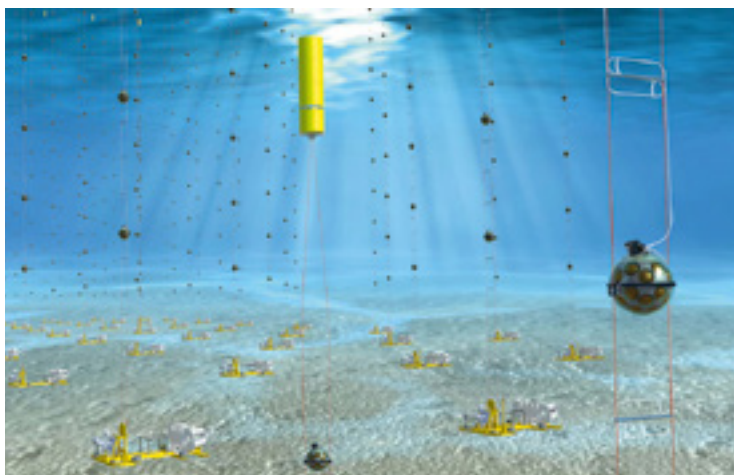
PHYSICS

DAEMONS

A new underwater telescope for studying the properties of neutrinos

The main aim of the DAEMONS project was to unite French efforts to demonstrate the feasibility of the ORCA (Oscillation Research with Cosmics in the Abyss) submarine neutrino detector, dedicated primarily to measuring the neutrino mass hierarchy (NMH).

The project required significant efforts in terms of studies based on simulations and in the preparations for using the detector, which is currently being installed at the KM3NeT experiment's French site off Toulon. The experimental aspect included the development of the first specific detector calibration unit, which will enable the best possible use of the data. Given the global competition between experiments seeking to measure the NMH, the DAEMONS project successfully accelerated the ORCA feasibility study and the exploitation of the initial data obtained with the first elements of the detector. ANR's support enabled the French teams to play an important role in demonstrating the feasibility of the ORCA project. The results obtained from detailed simulations and the first data from the prototype confirmed ORCA's excellent potential for competitive NMH measurements.



PERSPECTIVES

DAEMONS led to the scaling up of the French collaboration in the construction of KM3NeT, the new submarine telescope for studying the properties of neutrinos. It produced nine publications in international journals and 37 papers at international conferences, together with several new national collaborations.

Artist's impression of the interior of part of the detector. We can see the detection units and the yellow buoy belonging to one of them.

© Edward Berbee/Nikhef

DAEMONS: Demonstration of Ability to Establish the Mass Ordering of Neutrinos in the Sea

ANR programme: AAPG

Edition, project duration: March 2016, 36 months

ANR grant: €450,000

Coordinator: Antoine Kouchner · antoine.kouchner@u-paris.fr

Coordinating entity: Laboratoire AstroParticule et Cosmologie

Project region: Île-de-France

Publication or main contribution: S. Aiello et al. [KM3NeT Collaboration], *Determining the neutrino mass ordering and oscillation parameters with KM3NeT/ORCA*, <https://arxiv.org/abs/2103.09885>

Partners:

- ▶ GRPHE Groupe de Recherche en Physique des Hautes Energies
- ▶ CNRS - APC AstroParticule et Cosmologie
- ▶ CNRS DR12 - CPPM Centre National de la Recherche Scientifique Délégation Provence et Corse - Centre de Physique des Particules de Marseille
- ▶ IPHC Institut Pluridisciplinaire Hubert Curien

MOLECULAR BIOLOGY • EPIGENETICS

EpiSperm3

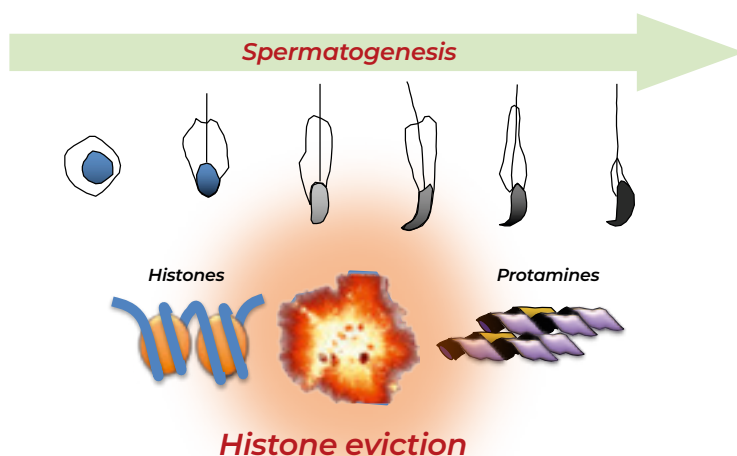
Molecular basis of post-meiotic male genome programming

Spermatozoa fulfil the essential mission of leaving the organism that produced them and swimming to the egg in an environment that is hostile and dangerous to the integrity of their genetic information. To minimise the risks and prevent the information from being altered, paternal DNA is carefully and rigorously packaged in advance using a mechanism that has so far remained obscure. One of the most remarkable phenomena in this packaging is the “metamorphosis” of the universal genome organisation, involving histones, into a new structure based on non-histone proteins. Designed to reveal the molecular basis for histone eviction at the scale of the genome when it is packaged, EpiSperm3 was conducted on a collaborative basis covering structural biology, proteomics and genomics, involving leading international collaborators in these fields. Thanks to this work, it is now possible to propose the first molecular models explaining this fundamental process and to generate new concepts applicable to epigenetics in general.



PERSPECTIVES

The work highlighted several regulation circuits with implications for genome biology in general. Significant impact is expected as the research continues, both in fundamental biology and in the specific fields of epigenetics, human reproduction and cancer biology.



EpiSperm3 revealed the mechanisms triggering the compacting of male DNA and the associated organisational metamorphosis.

© DR

EpiSperm3: Sperm epigenetics: programme 3

ANR programme: AAPG

Edition, project duration: September 2015, 48 months

ANR grant: €450,000

Coordinator: Saadi KHOCHBIN · saadi.khochbin@univ-grenoble-alpes.fr

Coordinating entity: IAB - Institut pour l'Avancée des Biosciences

Project region: Auvergne-Rhône-Alpes

Publication or main contribution: Barral S, Morozumi Y, Tanaka H, Montellier E, Govin J, de Dieuleveult M, Charbonnier G, Couté Y, Puthier D, Buchou T, Boussouar F, Urahama T, Fenaille F, Curtet S, Héry P, Fernandez-Nunez N, Shiota H, Gérard M, Rousseaux S, Kurumizaka H, Khochbin S (2017) *Histone Variant H2A.L.2 Guides Transition Protein-Dependent Protamine Assembly in Male Germ Cells. Molecular Cell.* 66: 89-101.e8.

Partners:

► IAB, CR - CNRS UMR5309 ; Inserm U823 ; UGA

► UVHCI-EMBL CNRS-UGA-EMBL International Unit (UMI 3265)

FINANCE • ECONOMETRICS • MANAGEMENT • ECONOMICS

MultiRisk

Econometric methods for the modelling of multiple risks

MultiRisk focuses on the fields of finance and financial econometrics. It is designed to contribute to a better analysis of financial risks, and specifically market risk, liquidity risk and systemic risk. The project has led to theoretical results in several areas such as measuring the conditional risk of financial asset portfolio yields and methods for backtesting systemic risk measurements. These advances have generated several publications in the best academic journals in finance and econometrics. The project brought together experienced and more junior researchers in management science, economic science and applied mathematics. As well as its scientific goals, MultiRisk aimed to promote reproducible research and to encourage the training of young researchers. Denisa Banulescu, a member of the project, received the 2016 Young Researcher award from the French Financial Markets Authority. Another junior member of the project, Jérémy Leymarie, won the prize for best market finance thesis from the French Finance Association in 2019.



PERSPECTIVES

MultiRisk led to the development of new formal procedures for financial tests, making it possible to answer questions such as the following: does a specific institution contribute significantly to the overall risk in the financial system? What are the institutions that contribute most to systemic risk?

Modelling financial risks.

© Getty Images International, iStock

MultiRisk: Econometric methods for the modelling of multiple risks

ANR programme: AAPG

Edition, project duration: September 2016, 36 months

ANR grant: €281,880

Coordinator: Christophe HURLIN · christophe.hurlin@univ-orleans.fr

Project website: <http://christian.franco140.free.fr/Christian-Francoq/MultiRisk/MultiRisk.htm>

Coordinating entity: Université d'Orléans, LEO FRE CNRS 2014

Project region: Centre-Val de Loire

Publication or main contribution: Francoq C. and Zakoïan J-M. (2018) *Estimation risk for the VaR of portfolios driven by semi-parametric multivariate models*. *Journal of Econometrics* 205, 381--401

Partners:

- ▶ CREST - Centre de Recherche en Économie et Statistique, UMR 9194 CNRS
- ▶ DRM - Dauphine Recherche en Management, UMR 7088 CNRS Université Paris Dauphine PSL
- ▶ LEO - Laboratoire d'Économie d'Orléans, UMR 7322 Université d'Orléans - Université de Tours - CNRS

ARCHAEOLOGY • PALAEOGENOMICS • ANTHROPOLOGY
POPULATION GENETICS

ANCESTRA

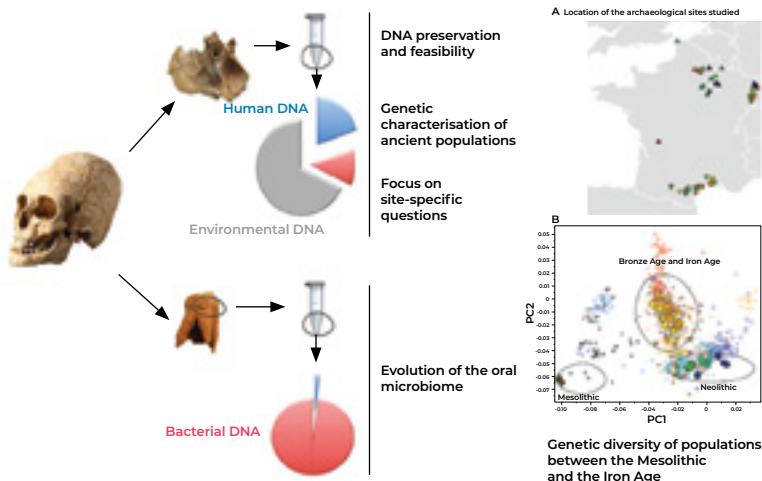
The peoples of France from the Neolithic to the Middle Ages, seen through the prism of palaeogenetics

Despite a widely known wealth of archaeological and historical information, few palaeogenetic data were available for France. The goal of ANCESTRA was to study the origins and dynamics of France's populations, combining culture with genetics. To achieve this, a genomic analysis was conducted on more than 600 individuals from archaeological sites spread across three regions (Hauts-de-France, Grand Est and Occitanie), covering a long chronological period from the Mesolithic to the High Middle Ages, a time that saw profound technological, cultural and social changes. This made it possible to highlight two major migration events following the last glacial period. These enriched and partially replaced the European palaeolithic gene pool, and were both associated with cultural changes that laid the foundations for our modern societies: agriculture and metallurgy. A second phase of the project involved studying the health of these populations, by analysing the DNA in the oral microbiome preserved in tartar, in order to trace the effect of migration on the emergence of certain diseases.



PERSPECTIVES

The ANCESTRA project published the first genomic data for ancient populations in France. It demonstrated the existence of migrations that shaped our genetic heritage and also laid the foundations for our society. These results help to rewrite the national story by shining a light on immigration.



Schematic representation of the stages, problems and results of the ANCESTRA project.

© M. Pruvost, CNRS photo : D. Gliksman, INRAP

ANCESTRA: The peoples of France from the Neolithic to the Middle Ages, seen through the prism of palaeogenetics

ANR programme: AAPG

Edition, project duration: October 2015, 42 months

ANR grant: €335,457

Coordinator: Mélanie PRUVOST • melanie.pruvost@u-bordeaux.fr

Coordinating entity: UMR 5199, PACEA (Université de Bordeaux)

Project region: Nouvelle-Aquitaine

Publication or main contribution: Brunel S., E.A Bennett, L. Cardin, D. Garraud, H. Barrand Emam, A. Beylier, B. Boulestin, F. Chenal, E. Cieselski, F. Convertini, B. Dedet, S. Desenne, J. Dubouloz, H. Duda, V. Fabre, E. Gailledrat, M. Gandelin, Y. Gleize, S. Goepfert, J. Guillaime, L. Hachem, M. Ilett, F. Lambach, F. Maziere, B. Perrin, S. Plouin, E. Pinard, I. Praud, I. Richard, V. Riquier, R. Roure, B. Sendra, C. Thevenet, S. Thiol, E. Vauquelin, L. Vergnaud, T. Grange, E-M Geigl, M. Pruvost (in press) *Ancient genomes from present-day France unveil 7,000 years of its demographic history*. PNAS 2020 <https://doi.org/10.1073/pnas.1918034117>

Partners:

► IJM - Institut Jacques Monod

► PACEA - De la Préhistoire à l'actuel: culture, environnement et anthropologie

COMPLEMENT SYSTEM • PROTEIN-PROTEIN INTERACTION
AUTOIMMUNITY • KIDNEY DISEASE

INFLACOMP

Mechanisms of complement-induced inflammation and endothelial cell damage in haemolytic conditions.

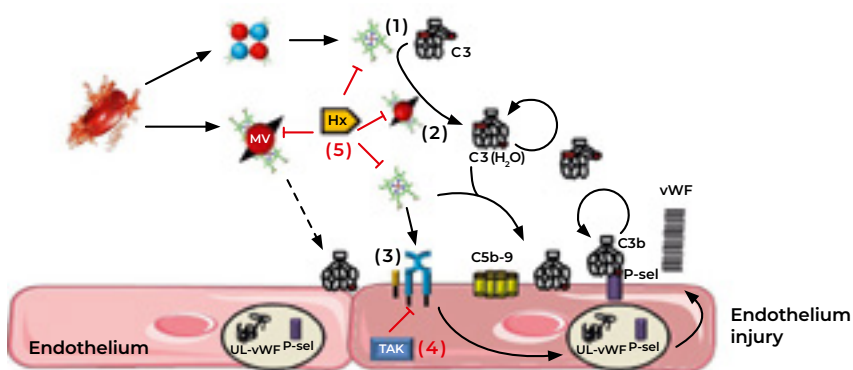
Complement is a surveillance system that can cause inflammation and tissue damage if it is over-activated. Haem, a prosthetic group of haemoglobin, is a carrier of oxygen from erythrocytes. Haem released during haemolysis represents a danger signal and causes inflammation and endothelial dysfunction. The INFLACOMP team discovered that haem activates the complement system and determines the pathophysiological impact of this complement activation on organ damage under haemolytic conditions.

The project discovered a new, unconventional mechanism by which haem causes endothelial injuries mediated by complement. This process is triggered by the activation of TLR4 by haem, which leads to the expression of P-selectin. This deposits the C3 and C3b bound to haem on the endothelial surface. The project also observed that haem triggers complement activation in vivo in patients and mouse models of sickle cell disease. These results will lay the foundation for effective new therapeutic approaches to control complement activation in haemolytic diseases.



PERSPECTIVES

INFLACOMP's results opened new avenues for research and aroused interest in studying complement and its inhibition in haemolytic diseases. Based on the results obtained, the first patient with sickle cell disease experiencing a severe vaso-occlusive crisis was successfully treated with complement blockers.



Mechanisms of complement activation (1, 2) and endothelial damage under haemolytic conditions (3, 4). Role of TLR4 and P-selectin (3, 4). Treatment with haemopexin guards against damage caused by complement under haemolytic conditions (5).

© Dr. Nicolas Merle

INFLACOMP: Inflammation and endothelial damage caused by complement and haemolysis

ANR programme: AAPG

Edition, project duration: December 2015, 36 months

ANR grant: €218,400

Coordinator: Lubka ROUMENINA · lubka.roumenina@sorbonne-universite.fr

Coordinating entity: INSERM UMRS 1138 Centre de Recherche des Cordeliers

Project region: Île-de-France

Publication or main contribution: 1. Merle NS, Paule R, Leon J, Daugan M, Robe-Rybkin T, Poillat V, Torset C, Fremeaux-Bacchi V, Dimitrov JD, and Roumenina LT. (2019) *P-selectin drives complement attack on endothelium during intravascular hemolysis in TLR-4/heme-dependent manner*. *Proc. Natl. Acad. Sci. USA*. 116(13):6280-6285. 2. Merle NS, Grunenwald A, Rajaratnam H, Gnemmi V, Frimat M, Figueres ML, Knockaert S, Bouzekri S, Charue D, Noe R, Robe-Rybkin T, Le-Hoang M, Brinkman N, Gentinetta T, Edler M, Petrillo S, Tolosano E, Miescher S, Le Jeune S, Houillier P, Chauvet S, Rabant M, Dimitrov JD, Fremeaux-Bacchi V, Blanc-Brude OP and Roumenina LT. (2018) *Intravascular hemolysis activates complement via cell-free heme and heme-loaded microvesicles*, *JCI insight*, 3(12). pii: 96910. doi: 10.1172/jci.insight.96910

AUDIO SIGNAL PROCESSING MACHINE LEARNING

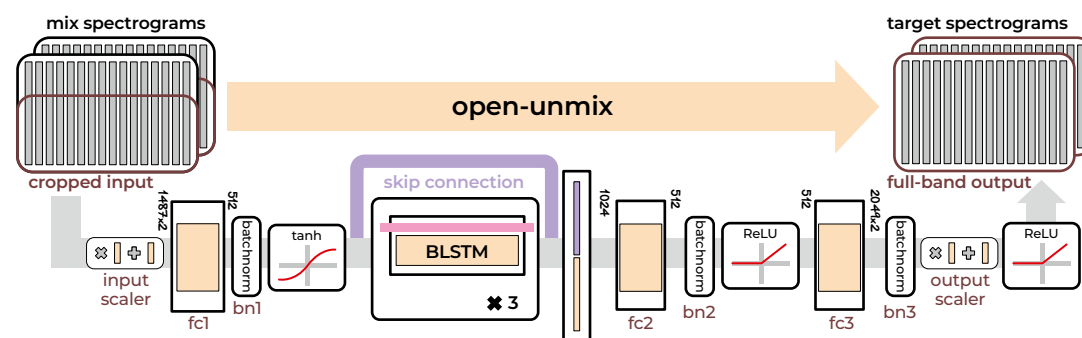
KAMoulox

Online unmixing for large sound archives

The KAMoulox project aims to develop cutting-edge audio restoration and separation techniques and interface them with the vast sound archives of CNRS – Musée de l'Homme. The aim is to make new-generation audio editing tools available to a wide audience, who can use them for scientific, educational and artistic purposes. The underlying hypothesis is that using these possibilities to edit historic recordings could help to create new practices in relation to our intangible heritage. KAMoulox thus fits into the theme of priority 3 of ANR's 2015 generic call for proposals: "Digital technology to serve the arts, heritage and the cultural and editorial industries". From a general viewpoint, KAMoulox responds to major scientific challenges in the field of probabilistic signal processing, and specifically the subject of source separation. The research focuses firstly on new probabilistic signal models and secondly on the use of deep neural networks for music unmixing.

The Open-Unmix deep model for source separation was developed as part of the KAMoulox project. It separates music into four tracks: voice, bass, percussion and accompaniment. Its implementation is now a reference in this area.

© Antoine Liutkus



PERSPECTIVES

From an application viewpoint, the project will lead to the development of a complete ecosystem under a free licence for research into audio source separation. It also has a significant mediation aspect and aims to transfer these technologies to other scientific communities and the general public.

KAMoulox: Kernel additive models for sound separation

ANR programme: AAPG

Edition, project duration: September 2015, 36 months

ANR grant: €282,828

Coordinator: Antoine LIUTKUS · Antoine.liutkus@inria.fr

Project website: <https://sigsep.github.io/>

Coordinating entity: Inria (Institut national de recherche en informatique et automatique)

Project region: Grand Est

Publication or main contribution: SigSep open-source ecosystem and many scientific papers · 2nd prize in the PyTorch summer hackathon

Partners:

► INRIA - Institut National de Recherche en Informatique et en Automatique

COLLOIDAL SYNTHESIS OF INORGANIC NANOCRYSTALS

NanoDoSe

Doping of semiconductor nanocrystals by soft chemistry and integration into optoelectronic devices

Semiconductor nanocrystals exhibit exceptional optical properties, which can be modified through the incorporation of impurities. NanoDoSe aimed to develop new pathways for the doping of nanocrystals via soft chemistry to give nanocrystals new electronic and optical properties. Two approaches were

explored: modifying the inorganic nanoparticle and modifying the surface chemistry of nanoparticles. Silver was introduced into CdSe nanoplatelets via partial cation exchange. In fact it is now possible to exchange the cation lattice of certain nanocrystals completely. Here, by controlling the partial exchange, the nanocrystals were doped with a few silver atoms per particle. As well as the original particle emission, a new transition appeared in the red, providing an emission continuum from green to red. For nanoparticles with a high ratio of surface area to volume, the project also showed that modifying the surface chemistry with different molecules enables control of electronic properties for materials with narrow band gaps, such as mercury chalcogenides. In the case of nanoparticles with wide band gaps, halogenide ligands enable very good control of surface traps.



PERSPECTIVES

Electrical doping has strong potential for the production of devices such as field-effect transistors. Obtaining information such as the charge carrier type (hole or electron), mobility and density is of primary importance. In the longer term, such nanocrystals could be used in optoelectronic devices such as diodes.

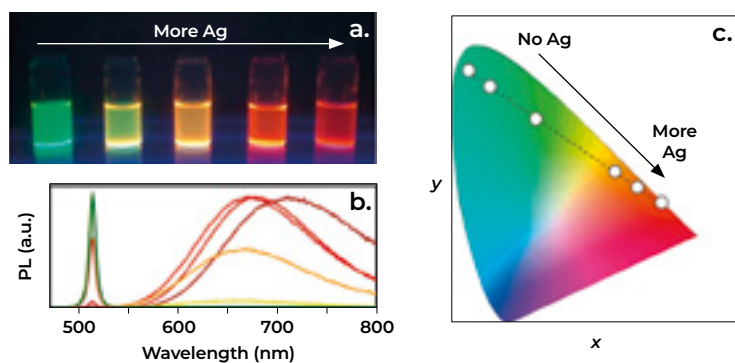


Figure a. Photo of CdSe nanoplatelet solutions with increasing quantities of Ag under UV excitation.

Figure b. Photoluminescence spectra of CdSe nanoplatelets with increasing quantities of Ag (green to red).

Figure c. Chromaticity diagram showing the positions associated with the photoluminescence spectra of CdSe nanoplatelets with increasing quantities of Ag.

© M. Dufour

NanoDoSe: Doping of semiconductor nanocrystals by soft chemistry

ANR programme: AAPG

Edition, project duration: September 2015, 36 months

ANR grant: €247,437

Coordinator: Sandrine ITHURRIA - Sandrine.ithurria@espci.fr

Coordinating entity: Laboratoire de Physique et d'Étude des Matériaux

Project region: Île-de-France

Publication or main contribution: Doping as Strategy to Tune Color of 2D colloidal Nanoplatelets, M. Dufour, E. Izquierdo, C. Livache, B. Martinez, M. G. Silly, T. Pons, E. Lhuillier, C. Delerue, and S. Ithurria, *ACS Appl. Mater. Interfaces* 11, 10128 (2019)

Partners:

► LPEM - Laboratoire de Physique et d'Étude des Matériaux

**SOCIOLOGY • ANTHROPOLOGY • GEOGRAPHY
POLITICAL SCIENCE • GLOBAL HEALTH**

SINAFRHOSP

Chinese-built hospitals in sub-Saharan Africa:
a new form of health cooperation?

The Chinese policy of cooperation in Africa is increasingly taking the form of hospital building. How do these institutions fit into the health systems of African countries? How are they perceived and adopted, and what policies can ensure their functionality and sustainability? The SINAFRHOSP project takes as a symbolic example the general referral hospital opened in Niamey, Niger, in 2017, which is designed to offer specialist medical and surgical care for the population. Thanks to a series of qualitative field surveys in Niger and China, the project studied the genesis of the hospital project in both countries and its concrete consequences. The project focused on a rapid collective identification of strategic groups within the new hospital, followed by observations and interviews aiming to analyse the issues of urban integration, innovations in the management of hospital waste, organisational reforms and the challenges of treatment accessibility. With its majestic architecture, the new hospital stands out as a geopolitical focal point and a promise of medical modernity, a promise that will require major financial and human investment.



PERSPECTIVES

The project developed survey and analysis tools to study new hospitals built in Africa. Adapted to different contexts, these methods could serve as a reference for global health studies on universal health cover or preparing health systems for managing epidemics.



◀ **The general referral hospital in Niamey, November 2018.**

© Fanny Chabrol

SINAFRHOSP: SINo-AFRican-HOSPitals

ANR programme: AAPG

Edition, project duration: March 2018 – November 2020, 24 months, six-month extension due to the Covid-19 epidemic

ANR grant: €58,920

Coordinator: Fanny CHABROL - fanny.chabrol@ird.fr

Project website: <https://sinafrhosp.hypotheses.org>

Coordinating entities: Centre Population et Développement (CEPED), UMR 196, Inserm ERL 1244, Institut de Recherche pour le Développement (IRD), Université de Paris (UP)

Project region: Île-de-France

Publication or main contribution: Chabrol Fanny, Lucien Albert et Valéry Ridde. *40 Years after Alma-Ata, Is Building New Hospitals in Low-Income and Lower-Middle-Income Countries Beneficial?* *BMJ Global Health* 3, no. e001293 (2019)

Partners:

▶ CEPED - Institut de Recherche pour le Développement - UMR CEPED

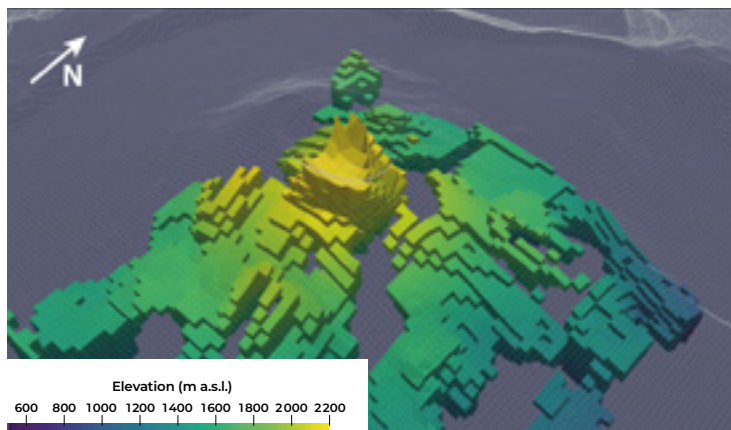
▶ LASDEL - Laboratoire d'Études et de Recherche sur les Dynamiques Sociales et le Développement Local

VOLCANOLOGY

SlideVOLC

Volcanic destabilisation: from observation to an integrated model of active deformation

Large-scale deformation and flank instabilities in volcanoes are among the most dangerous volcanic phenomena because they can lead to major destabilisation and landslides. In an island environment, flank collapse can also trigger hugely destructive tsunamis. On Réunion, a major destabilisation of the eastern flank of Piton de la Fournaise would have catastrophic impacts. Understanding large-scale deformation and flank instabilities in volcanoes is thus of major interest. Our capacity to predict such catastrophic events relies on both our understanding of the complex link between the stress field and the volcanic and hydrothermal processes, and our ability to interpret the monitored signals as precursors. This project, focusing on Piton de la Fournaise, successfully characterised the extension of the deformations and fractures on the volcano, the hydrothermal system and the actual rheology of the edifice using innovative multidisciplinary methods. It will also make it possible to use this new information to model the deformation field and the destabilisation dynamic of the volcano's flank.



PERSPECTIVES

The project will enable the production of a realistic “3D digital volcano”, an integrated model of the volcanic edifice’s deformation, helping to understand and monitor the stability and movement of the flanks in order to predict the temporal and spatial evolution of the edifice’s deformation during and between eruptions.

3D extraction of the conductive body imaged by electromagnetic models beneath Piton de la Fournaise. The model is represented according to the altitude of each cell.

© Dumont et al., 2019

SlideVOLC

ANR programme: AAPG

Edition, project duration: 2016, 36 months

ANR grant: €285,937.60

Coordinator: Aline PELTIER · peltier@ipgp.fr

Coordinating entity: Institut de Physique du Globe de Paris

Project region: La Réunion

Publication or main contribution: Dumont, M., A. Peltier, E. Roblin, P.A. Reninger, S. Barde-Cabusson, A. Finizola, V. Ferrazzini (2019), *Imagery of internal structure and destabilisation features of active volcano by 3D high resolution airborne electromagnetism*, *Scientific Reports*, 9, 18280, <https://doi.org/10.1038/s41598-019-54415-4>

Partners:

- ▶ IPGP - Institut de Physique du Globe de Paris
- ▶ Université Clermont Auvergne
- ▶ ISTERRE – Université de Savoie
- ▶ Cerema
- ▶ Stratagem 974
- ▶ Université de la Réunion
- ▶ Université de Toulouse
- ▶ Ludwig- Maximilians-Universität (LMU) Munich
- ▶ University of Cincinnati
- ▶ Northern Arizona University
- ▶ Université Sorbonne

REGENERATIVE MEDICINE • BIOTECHNOLOGY
HEALTH • ROBOTICS

BLOC-PRINT

Bio-printing assisted surgery for reconstructing skin and cartilage

Recent advances in intensive care and the treatment of injuries make it possible to treat patients with over 90% burns. However, severe burn patients remain a challenge due to the lack of healthy skin.

The standard technique for treating profound and extended burns is still taking thin autologous skin grafts from healthy or healed areas for transplantation in burned areas. But for patients with burns to more than 60% of their body, there are not enough healthy areas to cover all the burned areas immediately and permanently.

BLOC-PRINT proposes a new approach in which the patient's cells are used directly in the operating theatre to create the skin needed to treat acute burns. The technique developed enables complete skin (dermis and epidermis) to be recreated from the patient's cells using a 3D bio-printing process. The same technique is currently being validated for the custom production of autologous cartilage.

The success of this project will lead to a revolution in therapy for all civilian and military patients with severe burns.

The target patients are trauma victims who have been involved in fires, civilian accidents or military explosions. The process will also apply to athletes and workers in highly physically demanding professions such as army personnel.



PERSPECTIVES

The project has demonstrated that it is possible to produce an implantable bio-ink that can be used to create skin in vivo. BLOC-PRINT proposes a new paradigm in the field of regenerative medicine and represents new hope for trauma patients – the possibility of fast, custom reconstruction of autologous skin and cartilage tissue.



◀ **Bio-printing in vivo uses a robot arm equipped with a bio-printing head to re-cover the burn perfectly.**

© 3d.FAB.

BLOC-PRINT

ANR programme: ASTRID

Edition, project duration: October 2016, 36 months

ANR grant: €290,469

Coordinator: Christophe MARQUETTE · christophe.marquette@univ-lyon1.fr

Project website: <http://fabric-advanced-biology.univ-lyon1.fr/>

Coordinating entity: Institut de Chimie et Biochimie Moléculaires et Supramoléculaires (ICBMS)

Project region: Auvergne-Rhône-Alpes · Grand-Est

Publication or main contribution: Desanlis, A., Albouy, M., Rousselle, P., Thépot, A., Santos, M.D., Auxenfans, C. and Marquette, C.,

Validation of an implantable bioink using mechanical extraction of human skin cells: first steps to a 3D bioprinting treatment of deep second degree burn. Journal of Tissue Engineering and Regenerative Medicine, 20 Nov 2020, 15(1):37-48 DOI: <https://onlinelibrary.wiley.com/doi/epdf/10.1002/term.3148>

Partners:

- ▶ HCL - Hospices Civils de Lyon
- ▶ IMoPA - Ingénierie Moléculaire et Physiopathologie Articulaire
- ▶ LabSkin - LAB SKIN CREATIONS
- ▶ ICBMS - Institut de Chimie et Biochimie Moléculaires et Supramoléculaires

COMPUTER VISION

ACHMOV

Accurate human modelling in video

Recent technological advances now allow the acquisition of vast amounts of visual information through the use of image capturing devices such as digital cameras or camcorders. A central subject of interest in video is humans, their movements, actions, expressions and the ways they collaborate and communicate. The ability to analyse video data of humans has become a problem of key importance in a variety of fields, including video coding, virtual reality and human-computer interfaces. However, the visual analysis of humans in real-world environments still faces major scientific and algorithmic challenges. The dimensions and proportions of the human body vary widely across individuals. Any single human body has many degrees of freedom due to the joints and muscles, and its appearance can vary significantly. In addition, real-world events often involve multiple interacting humans occluded by each other or by other objects depending on the viewpoint. All these factors make appropriate models of human form and motion difficult to construct and to extract from images.



PERSPECTIVES

The goal of ACHMOV is to advance the state of the art in the field of human analysis in videos. It proposes development of new detailed representations of humans and their activities by combining machine learning and 2D image processing technologies with 3D technologies to represent and animate shapes.

Illustration of the reconstruction method developed in ACHMOV. Above is one of the 68 images acquired for each model for the 3D reconstruction. Below are the 3D geometric models obtained.

© Kinovis@INRIA

ACHMOV: ACcurate Human Modelling in Videos

ANR programme: AAPG

Edition, project duration: September 2014, 36 months

ANR grant: €286,444

Coordinator: Edmond BOYER · Edmond.Boyer@inria.fr

Project website: <http://morpheo.inrialpes.fr>

Coordinating entity: INRIA (Morpheo)

Project region: Auvergne-Rhône-Alpes

Publication or main contribution: *Analyzing Clothing Layer Deformation Statistics of 3D Human Motions.*

Jinlong Yang, Jean-Sébastien Franco, Franck Hetroy-Wheeler, Stefanie Wuhrer.

ECCV 2018 - European Conference on Computer Vision, Sep 2018 · Shape Reconstruction Using Volume Sweeping and Learned

Photoconsistency. Vincent Leroy, Jean-Sébastien Franco, Edmond Boyer. *ECCV 2018 - European Conference on Computer Vision, Sep 2018.*

Partners:

► IMAR - Bucharest Institute of mathematics of the Romanian academy – Bucharest

► INRIA - MORPHEO INRIA CENTRE GRENOBLE RHÔNE-ALPES

SOIL AND ENVIRONMENT • AGRONOMY

AGRONICKEL

Developing nickel agromining on ultramafic land in Europe

AGRONICKEL has improved agromining, growing plant crops to produce metals with high added value such as nickel. During the project, the diversity of metal hyperaccumulator plants was characterised more fully. New species were better identified and described, such as *Odontarrhena chalcidica*. Many species in the genera *Alyssum* and *Bornmuellera* offer prospects for agromining in Europe. Various cultivation approaches were successfully evaluated, including co-cultivation with legumes and using phytohormones and organic fertilisers. The use of rhizobacteria and endophytic fungi improve agromining yield. The optimisation of ecosystem services was also observed at the scale of the field: carbon storage, diversification of crop rotations and improved soil quality and agricultural productivity. There were two benefits. The biomass produced was used both for biofuel, which heated a building over the winter of 2018–2019, and for “green” nickel extraction, used by Daum for crystal production.



PERSPECTIVES

AGRONICKEL opens up new prospects for the cultivation of plants that accumulate metals. The research is continuing via the European LIFE-AGROMINE project, which involves seven of the AGRONICKEL project's partners. It also led to the creation of the company Econick by researchers at the University of Lorraine and CNRS in 2016.

◀ ***Odontarrhena albiflora***
(Albania, Korçë, Mali i Thate).

© Prof. Guillaume Echevarria

AGRONICKEL

Action: FACCE SURPLUS sustainable and resilient agriculture for food and non-food systems

Edition, project duration: January 2016, 36 months s

ANR grant: €202,000

Coordinator: Guillaume ECHEVARRIA

Project websites: <https://life-agromine.com/projet-agronickel/> · <https://projects.au.dk/facceturplus/research-projects-1st-call/agronickel/>

Coordinating entity: Université de Lorraine

Project region: Grand Est + Albania, Austria, Spain, Greece, Italy, Poland

Publication or main contribution: Saad R.F., Echevarria G., Rodríguez-Garrido B., Kidd P., Benizri E. A two-year field study of nickel-agromining using *Odontarrhena chalcidica*-cropped with a legume on an ultramafic soil: temporal variation in plant biomass, nickel yields and taxonomic and bacterial functional diversity. *Plant Soil* (2021). <https://doi.org/10.1007/s11104-021-04834-y>

Partners:

- ▶ Université de Lorraine, Laboratoire Sols et Environnement, France
- ▶ CNRS, France
- ▶ CSIC, Spain
- ▶ University of Natural Resources and Life Sciences Vienna, Austria
- ▶ Jagiellonian University, Poland
- ▶ University of Tirana, Albania
- ▶ Università di Firenze, Italy
- ▶ Eastern Macedonia and Thrace Institute of Technology, Greece
- ▶ MICROHUMUS, France

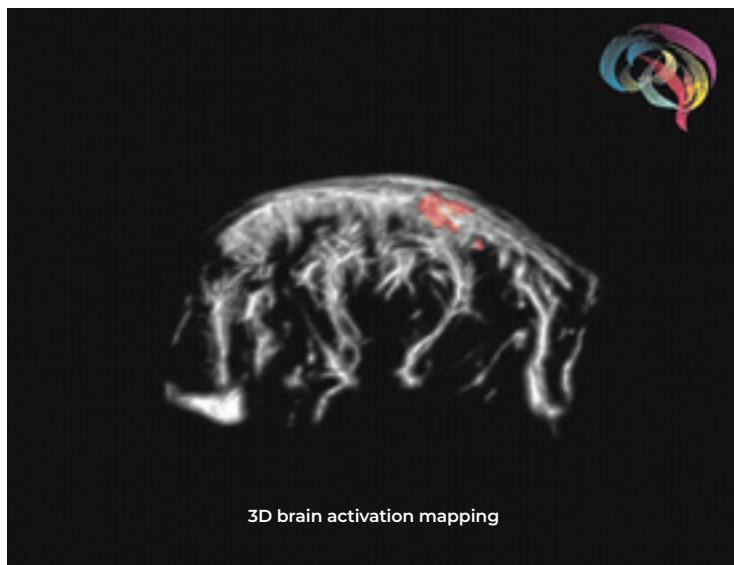
NEUROSCIENCE • ULTRASOUND IMAGING • AWAKE IMAGING
DRUG EFFECT MONITORING

FUSIMICE

A new ultrasound technique for visualising rodents' brains in action

A new ultrasound technique was developed to analyse what is happening in a rodent's brain while it carries out an activity. Ready to use, portable and relatively affordable, this method enables easy use in neuroscience laboratories and in industry.

Brain activity can be monitored quickly and in a very precise, targeted way in rodents while they are awake. The rodents targeted contribute to the understanding of certain disorders such as autism or chronic pain. The project led to the creation of a start-up, Iconeus, based in France, and the marketing of ultrasound imaging equipment for this type of study.



PERSPECTIVES

The technique developed can be used on a large scale to analyse the effects of drugs and the progress of diseases affecting the brain. The instrument should enable great progress in neuroscience in the field of preclinical studies.

3D image of an awake mouse brain, following activation by stimulating the whiskers.

© Jeremy Ferrier, Iconeus

FUSIMICE

ANR programme: FLAG-ERA HBP

Edition, project duration: 2015, 36 months

ANR grant: €400,000

Coordinator: Zsolt LENKEI • zsoldt.lenkei@espci.fr

Project website: <https://iconeus.com>

Coordinating entity: CNRS / Laboratoire Plasticité du Cerveau - UMR 8249 (FR coordinator; in collaboration with INSERM and other European partners)

Project region: Île-de-France

Publication or main contribution: *Functional imaging evidence for task-induced deactivation and disconnection of a major default mode network hub in the mouse brain.* Ferrier J, Tiran E, Deffieux T, Tanter M, Lenkei Z. Proc Natl Acad Sci USA; 2020 Jun 30;117(26):15270-15280. doi: 10.1073/pnas.1920475117. Epub 2020 Jun 15.

Partners:

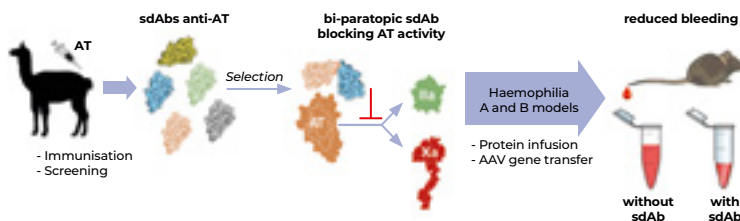
- ▶ Partners: Institut National de la Santé et de la Recherche Médicale (INSERM) - U 979 (France)
- ▶ Institute of Experimental Medicine of the Hungarian Academy of Science / Department of Cellular and Network (Hungary)
- ▶ University of Antwerp / Department of Biomedical Sciences (Belgium)

HAEMATOLOGY (MEDICAL FIELD) • RARE DISEASES
GENE THERAPY • BIOMEDICAL INNOVATION

SMART-HaemoCare

Using llama antibodies to treat haemophilia

The coagulation cascade is a finely regulated process that involves procoagulant factors (such as factor VIII or factor IX) and anticoagulants (such as antithrombin). The absence of factor VIII or factor IX in haemophilia A and B respectively shifts the balance towards ineffective blood clotting. New therapies for haemophilia have emerged in recent years, including alternative replacement therapies and gene therapy. While these are promising, improving patient care remains challenging. The SMART-HaemoCare team developed a new therapeutic approach for haemophilia based on inhibiting antithrombin using small antibody fragments derived from llamas. By neutralising the anticoagulant activity of antithrombin, haemostatic balance is restored. This antibody successfully corrected bleeding in a haemophiliac mouse model. The study also demonstrated that stable antibody expression in haemophiliac mice, mediated by a gene therapy approach, was well tolerated and had little immunogenic effect. Above all, it also led to sustained correction of the bleeding phenotype, even in the presence of antibodies inhibiting coagulation factor IX.



AT: antithrombin; sdAB: single domain antibody; Ila: thrombin; Xa: Factor Xa



Nanobodies directed against antithrombin, a natural anticoagulant, were developed. By blocking the function of antithrombin, these nanobodies proved effective in correcting the bleeding phenotype of haemophiliac mice, both in an approach using proteins and in a gene therapy approach.

© P. Lenting (Inserm U1176)



PERSPECTIVES

The project led to a new therapeutic approach for haemophilia using proteins and gene therapy. New approaches were prepared to reduce the immunogenicity of viral vectors. A first generation of ON/OFF viral vectors was developed. The creation of the start-up Laelaps Therapeutics will enable the clinical viability of these approaches to be explored.

SMART-HaemoCare

Action: ERA-NET

Edition, project duration: February 2016, 36 months

ANR grant: €317,325

Coordinator: Peter LENTING · Peter.Lenting@inserm.fr

Coordinating entity: INSERM - Le Kremlin-Bicêtre

Project region: Île-de-France

Publication or main contribution: Barbon E, Aymé G et al. *Single-domain antibodies targeting antithrombin reduce bleeding in hemophilic mice with or without inhibitors*

Partners:

- ▶ Dr. David LILLICRAP, Dept. of Pathology & Molecular Medicine, Queen's University, Kingston, Canada
- ▶ Dr. Federico MINGOZZI, Genethon, Inserm U951, Evry, France
- ▶ Dr. Dirk GRIMM, Dept. of Infectious Diseases, Heidelberg University Hospital, Heidelberg, Germany



BIOLOGY AND HEALTH

LUMIERE

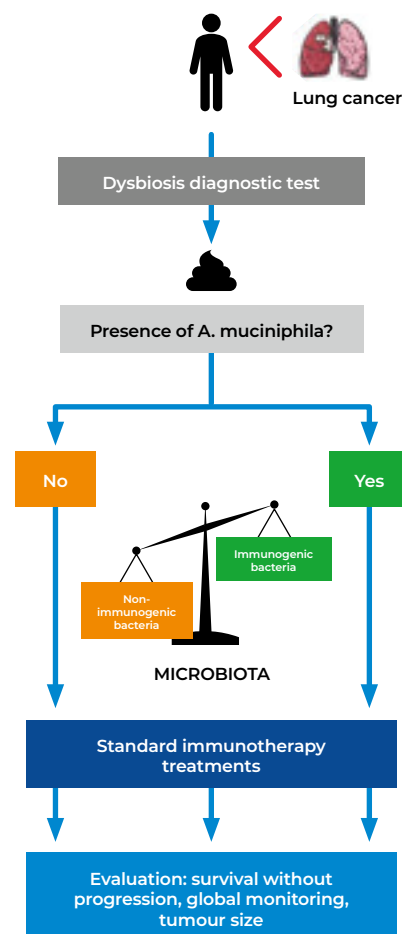
Role of the gut microbiota in the response to immunotherapy for lung cancer

Lung cancer causes nearly 30,000 deaths a year in France, and immunotherapy treatments can prolong patients' survival significantly. Success remains mixed, however, because only some patients develop an anti-tumour response. Understanding the reasons for this partial success is clearly essential. Studies have already shown that the gut microbiota play an important role in the anti-tumour response. In this context, the LUMIERE project has two main objectives. The first is to develop diagnostic tools able to predict the response to immunotherapy based on the faecal microbiota signatures of patients with lung cancer. The second is to develop therapeutic solutions such as "anticancer probiotics" or "oncobiotics" to increase the chances of success with immunotherapy. The work has already confirmed the harmful effect of antibiotics on immunotherapy effectiveness and defined a signature for microbiota imbalance or "dysbiosis" associated with non-response to immunotherapy for lung cancer. LUMIERE has helped to identify probiotic bacteria associated with response to immunotherapy, such as *Akkermansia muciniphila*, and others associated with non-response.



PERSPECTIVES

Building on the LUMIERE project, several further developments are planned, including a routine test to detect dysbiosis associated with the presence or absence of *A. muciniphila* in the faeces and a clinical trial of administering *A. muciniphila* to treat dysbiosis and prevent resistance to immunotherapy. The project also aims to refine the dysbiosis signature already established by the team.



Study of the impact of dysbiosis on immunotherapy treatment.

© Sow C. et Zitvogel L.

LUMIERE: LUng cancer and Microbiota Interactions for Immunotherapy Efficacy in REfractory patients

Action: University-Hospital Research in Health

Edition, project duration: from 1 October 2016 to 30 September 2021

PIA grant: €9,000,000

Coordinator: Laurence ZITVOGEL · laurence.zitvogel@gustaveroussy.fr

Project website: <https://www.gustaveroussy.fr/fr/rhu-lumiere>

Coordinating entity: Institut Gustave Roussy

Project region: Île-de-France

Publication or main contribution: Fluckiger A, Daillère R, Sassi M, et al. Cross-reactivity between MHC class I-restricted antigens from cancer cells and an enterococcal bacteriophage. *Science*. 2020;369 (6506):936-942.

Partners:

- ▶ INRAE Centre Siège
- ▶ Institut Pasteur
- ▶ INSERM Délégation Paris 11
- ▶ UNICANCER
- ▶ AstraZeneca
- ▶ Maat Pharma
- ▶ Sanofi-Aventis Recherche & Développement
- ▶ IHU Méditerranée Infection
- ▶ Université de Paris
- ▶ Université Paris-Saclay



**SOCIAL SCIENCES AND HUMANITIES
LIFE SCIENCES • ENGINEERING SCIENCES**

MATRICE 13 novembre

Programme on the memory of the terrorist attacks of 13 November 2015

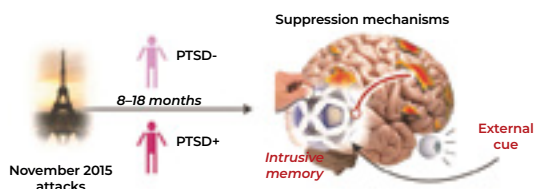
The “equipment of excellence” MATRICE was selected in February 2011. Its goal was to provide technological tools for understanding the links between individual and collective memory. Coordinated by a historian, the project aimed to be transdisciplinary. Following the 2015 terrorist attacks, the team worked with a neuropsychologist to propose a broad programme studying individual and collective memories of this traumatic event. The programme incorporates several aspects – recording 1,000 witnesses on four occasions over 10 years, a biomedical study of 200 witnesses targeting a better understanding of post-traumatic stress disorder (PTSD), a regular survey to capture the collective memory of the French population as faithfully as possible and an epidemiological public health study. In 2020, an article was published in *Science*, 1,431 hours of statements were transcribed (end of phase 1), two papers were published on the public health aspect, two books appeared (*13 novembre* published by Odile Jacob and *Victimes du terrorisme* published by Hermann), two series appeared in English-language journals (legal and literary) and four online opinion surveys were conducted.



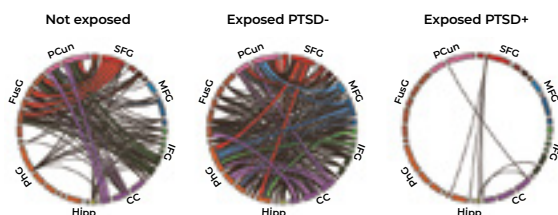
PERSPECTIVES

Building on the project's results, the aim now is to analyse the vocabulary used by witnesses and launch two new projects studying the GABA neurotransmitter in PTSD and transmission/resilience in children. By applying multiple approaches, MATRICE aims to provide an analysis model for the world's scientists responding to trauma. At stake is the emergence of a new science of memory working across disciplines. Society, too, needs tools to build resilience when confronted with the trauma of terrorist attacks.

Inclusion of people directly exposed, and the task of memory suppression



Brain connectivity during memory suppression



Memory suppression, a new avenue for understanding trauma: the brain mechanisms controlling memory are affected in people who develop PTSD after the attacks, but preserved in people with greater resilience.

© Science, février 2020

MATRICE 13 novembre

Action: EQUIPEX

Edition, project duration: from 15 December 2011 to 31 December 2022 (beginning of Matrice – end of 13 novembre)

PIA grant: €7,800,000 (for the period 2016–2022)

Coordinator: Denis PESCHANSKI · denis.peschanski@cnrs.fr

Project website: <https://www.memoire13novembre.fr>

Coordinating entity: HESAM Université

Project region: Île-de-France

Partners: CNRS · INSERM · EPHE · EHESS · ECPAD · Université de Paris · Université Paris I Panthéon-Sorbonne · Université Sorbonne Nouvelle · Université Paris Nanterre · Université de Rennes 1 · Université de Lorraine Université Caen Normandie · Université Montpellier · Université Paul-Valéry Montpellier 3 · ENS Lyon · ENS Paris-Saclay · ENS – PSL · Université Jean Monnet Saint-Étienne · Universités Lumière Lyon 2 · Université Jean Moulin Lyon 3 · Université Clermont-Auvergne · Université Côte d'Azur · Centre Hospitalier Universitaire Caen Normandie · Direction des Patrimoines, de la Mémoire et des Archives, Ministère des Armées · CREDOC · CYCERON · INA · SIAF · Santé Publique France · Le Parisien · Aujourd'hui en France · France Culture · Œuvre de Secours aux Enfants · Archives nationales · Établissement public du Palais de la découverte et de la Cité des sciences et de l'industrie



INDUSTRIAL BIOTECHNOLOGY

TWB

Accelerating the development of bioproduction

Since its launch in 2012, TWB has succeeded in developing an original, stand-out model by creating innovative, sustainable approaches to transforming renewable raw materials into useful products via industrial biotechnologies. The model is characterised by:

- A dynamic public-private ecosystem involving all the players in the economic value chain (start-ups, SMEs, major corporations, investors, research and higher education organisations, local authorities),
- A consortium agreement facilitating contractual relations (industrial property) between public research and industrial companies,
- Technology platforms equipped with advanced, highly automated facilities, with a continuum of expertise from gene to product,
- High-level public collaborations. Results have been plentiful, with a public-private consortium of 52 members as of 1 January 2020, including 34 companies, six start-ups hosted at TWB's premises, 82 of TWB's own staff and 40 employees of the hosted start-ups. Between 2012 and 2020, 214 R&D projects were conducted, including 148 industrial contracts, with 22 patents and €41.8 million of industrial contracts signed.



PERSPECTIVES

Building on the recognition of its economic impact and its scientific and technological excellence, TWB aims to become the European leader in project management and innovation support by 2025, enabling its industrial and academic partners to meet the challenges of climate change and the food supply.

← Battery of fermenters for growing microorganisms and optimising processes.

© TWB / B. Hamousin

TWB: Toulouse White Biotechnology

Action: Preindustrial biotechnology demonstrators

Edition, project duration: from 1 October 2011 to 31 December 2024

PIA grant: €26,999,663

Coordinator: Olivier ROLLAND · olivier.rolland@inrae.fr

Project website: <https://www.toulouse-white-biotechnology.com>

Coordinating entity: INRAE (Institut national de recherche pour l'agriculture, l'alimentation et l'environnement)

Project region: Occitanie

Partners:

▶ INRAE Transfert (2011-2020)

▶ Institut Catholique de Toulouse (2011-2020)



3

Organisation and governance

Serving research and its funding recipients, ANR aims to adapt its organisation to ensure quality at all times, developing a smooth, optimised operation to manage risks appropriately while carrying out actions to improve working conditions. Here we look back at 2020, with highlights including the strengthening of human resources commitments, the disability policy, the mechanism for preventing violence, discrimination, bullying and sexist behaviour, jobs and skills planning etc.

PAGE 74. Human resources: strengthened projects

PAGE 76. The Agency's budget

PAGE 78. Organisation chart **PAGE 80.** The Governing Board **PAGE 81.** The Scientific Advisory Panel

ORGANISATION OF THE AGENCY

Human resources: strengthened projects

Reinforcing the disability policy, preventing and monitoring violence, bullying and discrimination, measures to improve transparency about salary and mobility prospects – ANR made progress on many human resources projects in 2020.

Spotlight on the ANR approach to disability

Over the past year, the Agency has taken steps as part of its policy on welcoming people with disabilities, starting with the signature of an occupational health, safety and disability charter in July 2020. This document sets out the steps for achieving recognition as a disabled employee, together with possibilities for adapting working conditions (hours, position etc.) for employees with disabilities. In application of this charter, two voluntary disability officers were appointed internally. A competition was also held enabling staff to vote for a logo symbolising the Agency's disability programme. Other actions to raise awareness of disability among ANR staff included organising an intervention by a specialist to improve the image of disability during European Disability Employment Week, from 16 to 20 November 2020, focusing on invisible disabilities: "The goal was to overcome stereotypes and convey the idea that it is perfectly normal to discuss this health issue," explains Philippe Terral, the Agency's HR Director. "Around 60 interviews were also held with people eligible for disability recognition. For some, this was a turning point." Four employees acquired this recognition in 2020, and more applications were submitted.

Preventing and addressing violence, discrimination and bullying

The system for preventing, reporting and addressing psychosocial risks (PSR) and violence, discrimination, bullying and sexist behaviour (VDBS) was developed in 2020, for application from 2021. Building on the Quality of Life at Work & PSR programmes launched in 2015, a procedure for collecting and following up reports from people who have suffered or witnessed such behaviour was developed, in application of the 6 August 2019 civil service reform act. The system sets out a multi-stage process: confidential listening by a designated and specially trained contact person; reporting to the monitoring and guidance unit; mediation/conciliation (PSR) or arbitration (VDBS). At the same time, victim support and protection measures must be taken as soon as these actions are reported, calling on the services of external players if necessary: associations, psychologists, occupational doctors, social workers etc. The system also specifies communication and awareness-raising activities associated with these issues (posters, welcome booklet, dedicated week)



“Overcoming stereotypes about disability to discuss the subject openly.”

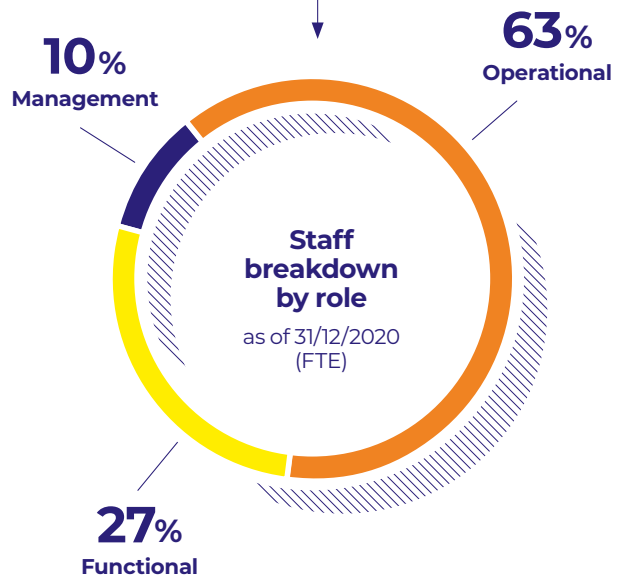
PHILIPPE TERRAL
ANR HR DIRECTOR

and training for the relevant contacts and managers about these themes, including an e-learning module. Meanwhile, the second major jobs and skills planning project of the year was dedicated to redefining the role of the scientific project managers, who represent about a third of ANR's staff. Four levels were defined within the role, with associated pay grades, based on objective criteria of skills, experience and responsibility. Again, the goal was to improve transparency about salaries and prospects for advancement, both for people in post and for recruitment candidates.

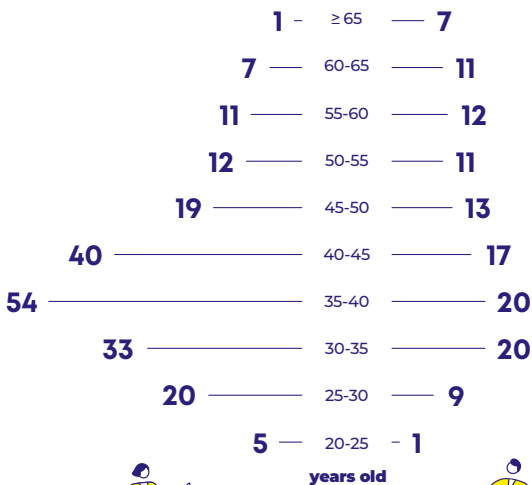
— FOCUS

Development of jobs and skills planning

Two projects were completed during 2020 as part of the development of jobs and skills planning. The PACI method (Project, Autonomy, Complexity, Influence/Impact) was adopted for scoring the posts and roles in the reference system of jobs and skills. This project aimed partly to encourage internal mobility, by highlighting the complementary links between different jobs and prospects for development within the Agency, and partly to improve salary transparency. This scoring method is now used to produce the salary diagrams in the social balance sheet, based on groups of reference jobs.



Age pyramid by gender



ORGANISATION OF THE AGENCY

The Agency's budget

The agency's budget consists of an operating budget, which enables it to implement all its processes, and a funding budget, which is devoted to funding research projects.

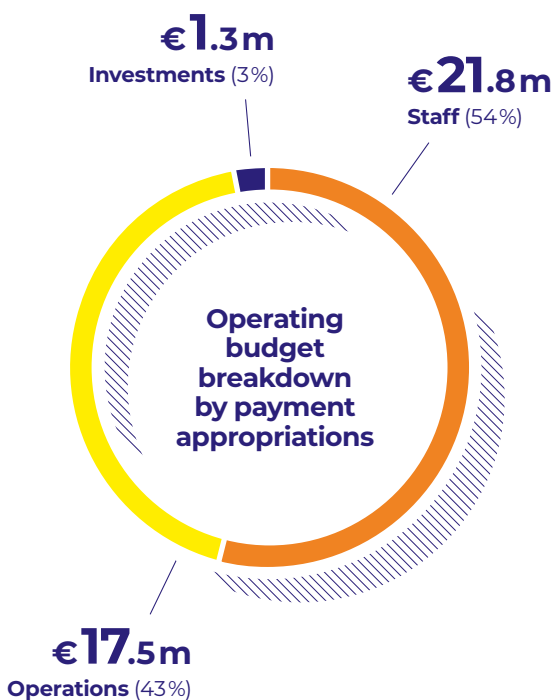
The operating budget for running the Agency

This represents spending on operations, staff and investment. In 2020, it amounted to €38.7 million of commitment authorisations and €40.5 million of payment appropriations. It is divided as follows in terms of payment appropriations: the operating budget is financed primarily by the public service subsidy of €29.1 million, with other resources including:

- The management fees received by the ANR from organisations co-funding research projects;
- The SGPI (General Investment Secretariat) payment for ANR's expenses in managing major state investment programmes (Investments for the Future).

The research funding budget

In 2020, ANR provided funding for research projects through commitment authorisations amounting to €780 million, €55.5 million more than in 2019 and €108.2 million more than in 2018. These rises enabled the selection rate for the Generic Call for Proposals to be increased in 2020 by allocating an extra €35.5 million compared with 2019, €30.2 million to be allocated to artificial intelligence projects through a multi-year plan launched by the French Ministry of Higher Education, Research and Innovation (MESRI), and €19.1 million to be contributed to initiatives to combat Covid-19. The funding budget makes it possible to commit grants for projects selected in 2020 that will run over several years. The resources come mostly from the funding subsidy allocated by MESRI, amounting to €766.2 million in 2020 after a transfer to the reserves. The agency's funding budget has seen successive significant increases over recent years: +€50.5 million in 2018, +€49.5 million in 2019, +€62.3 million in 2020. Funding for 2020 AAPG projects rose by €56.6 million compared with 2018, and by €35.5 million compared with 2019. Co-funding from public bodies and contributions from the European Commission represented €14.3 million in 2020, 2% of the total funding budget. Disbursements in 2020 represented €736 million, an increase of €6.43 million relative to 2019.



Breakdown of the funding budget in commitment authorisations

The 2020 funding budget is divided between:

- The AAPG;
- Specific calls for proposals;
- Projects outside the calls for proposals. In total, excluding Carnot, calls for proposals represent €619.8 million, 79.4% of the funding budget. Other projects (Préciptut, INCa, Carnot, RTB) represent €160.6 million, 20.6% of the budget.

Outside calls for proposals

€160.6m

including Carnot – €62m; INCa – €38m; Préciptut – €56.8m etc.

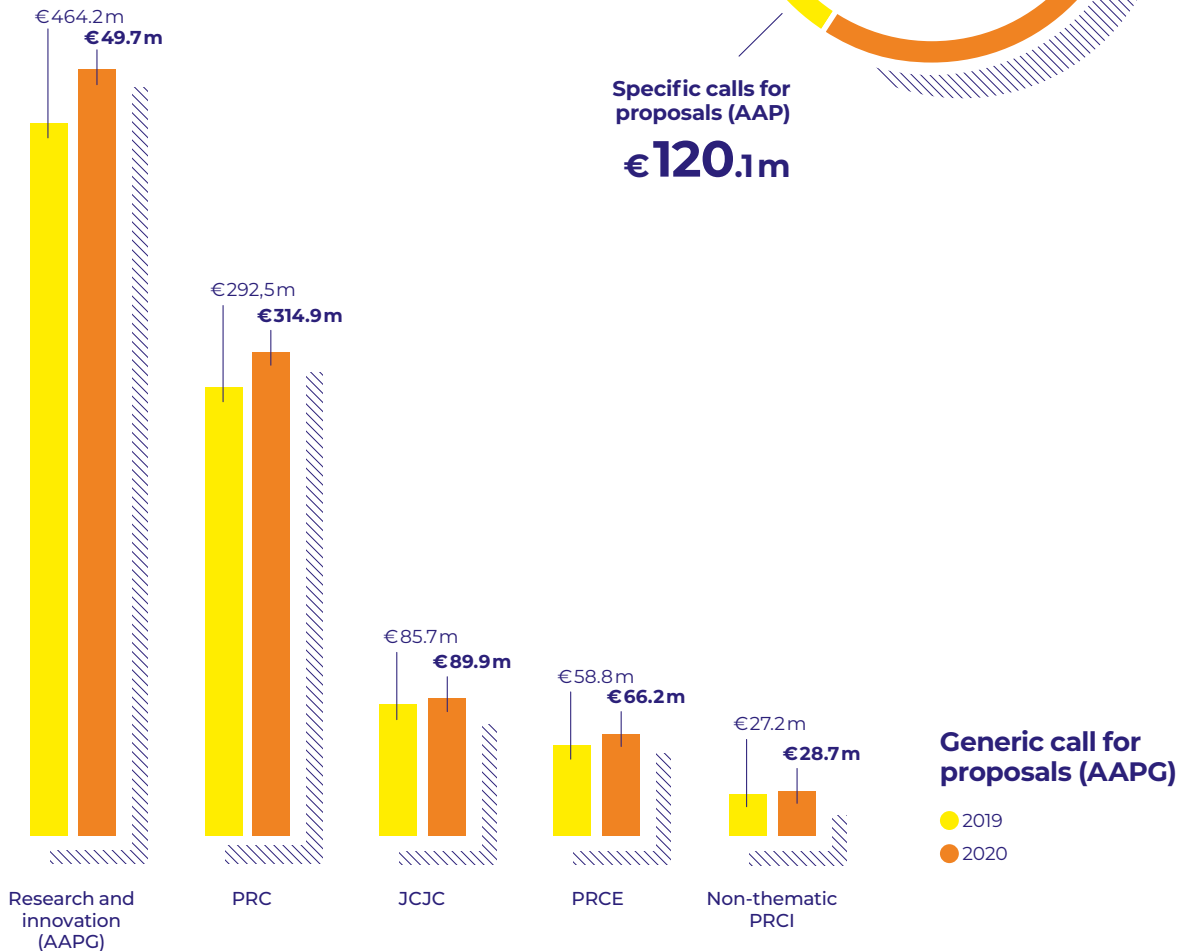
Generic call for proposals (AAPG)

€499.7m



Specific calls for proposals (AAP)

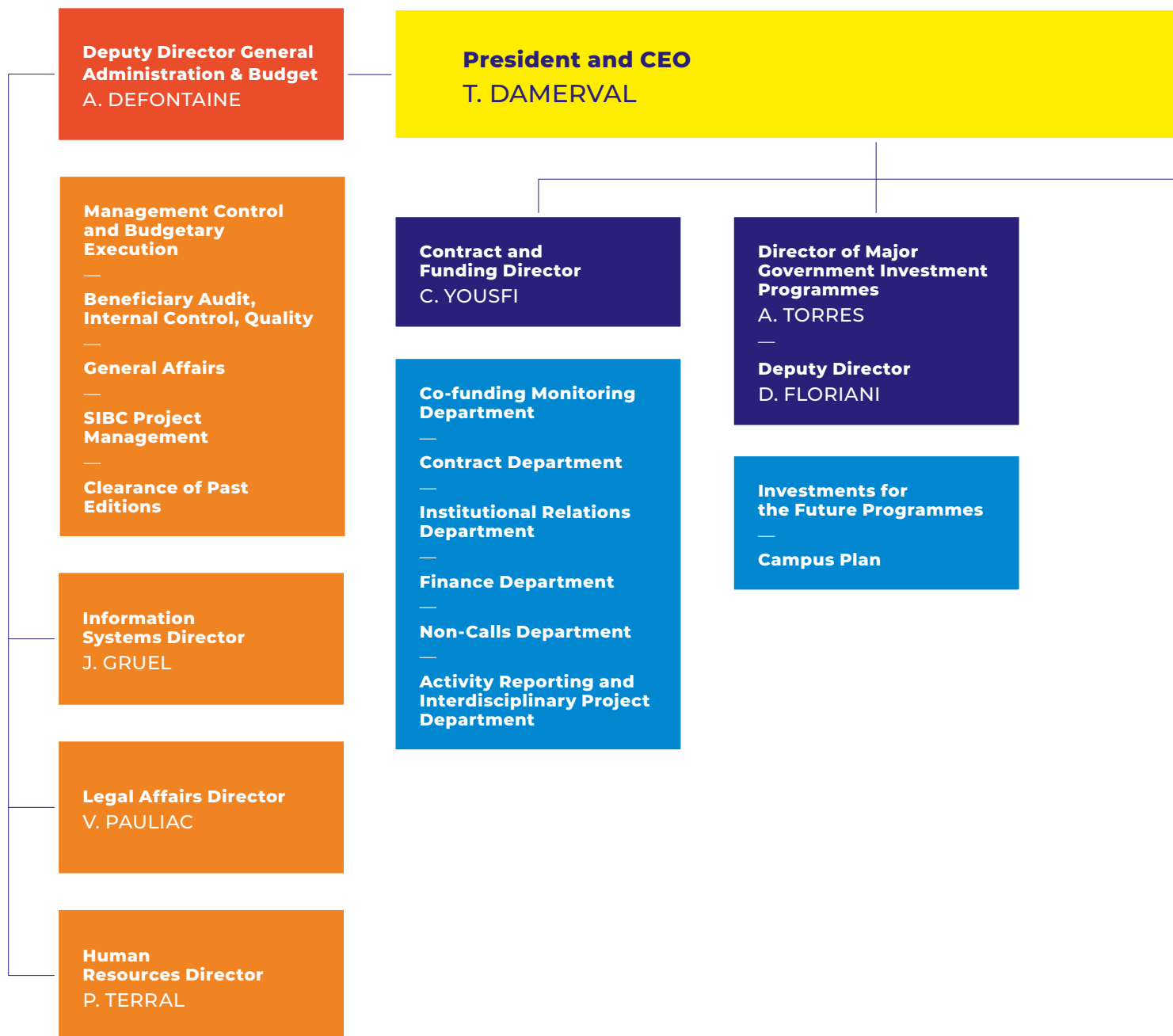
€120.1m



GOVERNANCE

Organisation chart

as of 30 January 2021





GOVERNANCE

The Governing Board

The members of the ANR Governing Board are appointed by decree by the Ministry of Higher Education, Research and Innovation.

Composition

President: Thierry DAMERVAL

As representatives of the French state:

- Claire Giry, Director General of Research and Innovation, and Mélanie Joder, Director of Financial Affairs, full members representing the Minister of Research;
- Vincent Motyka, Head of Performance, Funding and Contract Negotiation with Research Organisations, and Guilhem de Robillard, Deputy Director of the Research and Higher Education Budget at the Financial Affairs Department, substitute members representing the Minister of Research;
- Anne-Sophie Barthez, Director General of Higher Education and Employability, full member representing the Minister of Higher Education;
- Caroline Ollivier-Yaniv, Coordinator of the College of Scientific and Educational Advisors in the Department of Higher Education and Employability, substitute member representing the Minister of Higher Education;
- Benjamin Delozier, Head of the Competitiveness, Innovation and Business Development Department, Directorate General for Enterprise (DGE), and Michel Schmitt, member of the General Economy Council (CGE), full members representing the Minister of Industry;
- Nathalie Homobono, member of the General Economy, Industry, Energy and Technology Council (CGE), and Arnaud Delaunay, Deputy Director of Innovation at the DGE, substitute members representing the Minister of Industry;
- Alban Hautier, Deputy Director of the Third Budget Sub-Department, full member representing the Minister of the Budget;
- Colin Thomas, Head of the Research and Higher Education Office in the Budget Department, substitute member representing the Minister of the Budget.

As qualified representatives from the major scientific fields, including at least one representative of the Conference of Heads of Higher Education Institutions:

- Mohammed Benlahsen, President of the University of Picardy Jules Verne and President of the Ancre Alliance, full member;
- Gilles Bloch, President of INSERM and President of the AVIESAN Alliance, full member;
- Carole Caranta, Deputy Director General of Science and Innovation at INRAE, full member;
- Marie Gaille, INSHS Deputy Scientific Director at CNRS, full member;

- Sylvie Retailleau, President of University Paris-Saclay, full member;
- Bruno Sportisse, President and CEO of INRIA and President of the Allistene Alliance, full member;
- Michèle Rousseau, Director General of BRGM, substitute member;
- Elsa Cortijo, Director of Basic Research at CEA, substitute member;
- François Houllier, President and CEO of IFREMER and President of the AllEnvi Alliance, substitute member;
- Alain Schuhl, Deputy Director General of Science at CNRS, substitute member;
- Manuel Tunon de Lara, President of the University of Bordeaux and President of CPU, substitute member;
- Bernadette Dorizzi, Director of Research and Doctoral Courses at Télécom SudParis, substitute member.

The Vice President of the National Strategic Council for Research:

- Pascal Colombani

As qualified representatives of the business world:

- Bruno Maquart, President of Universcience;
- Marie-Noëlle Semeria, Group Research and Development Director, Total;
- Philippe Tcheng, former President and CEO of the Sanofi-Aventis Group;
- Catherine Truffert, President and CEO, Iris Instruments.

As staff representatives:

- Jean-Michel Le Roux, Carnot Programme Manager in the Scientific Operations Division, full member;
- Jannatul Mia, Scientific Project Manager in the Environment, Ecosystems and Biological Resources department, substitute member;
- Sophie Grelat, Lawyer in the Legal Affairs Division, full member;
- Delphine Callu, Scientific Project Manager in the Biology and Health department, substitute member.

In addition, attending the Board in an advisory role:

- The Chair of the Governing Board of the public establishment BPI-Groupe or their representative;
- The French General Commissioner for Investment or their representative;
- The Deputy Director General for Administration & Budget;
- The Budget Controller;
- The Accountancy Officer

GOVERNANCE

The Scientific Advisory Panel

The ANR Scientific Advisory Panel's role is to assist the President and CEO in the strategic guidance of the Agency. The President and CEO consults it for:

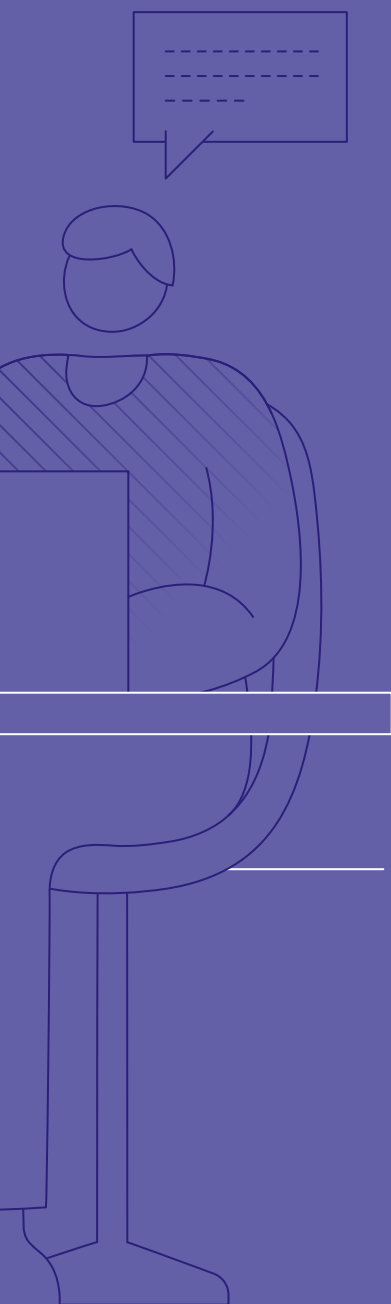
- The preparation of the ANR's Work Programme and the report on its implementation;
- Work to evaluate research provision and analyse its impact;
- The creation or abolition of the Agency's scientific departments, together with their naming and scope;
- The appointment of the Scientific Department Heads and the renewal of their functions. The Scientific Advisory Panel may also be asked to provide an opinion by the Agency's Governing Board or the CEO. Its composition, the procedure for appointing its members and its rules of procedure are set out by the ministerial order of 10 September 2015.

Composition

Established on 31 January 2019, the ANR Scientific Advisory Panel is chaired by Pierre Corvol, President of the French Academy of Sciences and an honorary director of the Collège de France. In addition to the President and CEO and the

heads of the Agency's scientific departments, the members are: figures from outside the ANR, including foreign contributors selected for their scientific and technical knowledge in the Agency's areas of activity:

- Bruno Chaudret, research director of the CNRS and a member of the French Academy of Sciences;
- Yuko Harayama, former executive member of the Japanese prime minister's Science and Technology Council;
- Nathalie de Noblet-Ducoudré, research director at the CEA and a member of the French Academy of Agriculture. Figures from the business world chosen for their knowledge about the operation and constraints of national research, development and innovation funding agencies:
- Valérie Mazza, science and innovation director at Limagrain group and a member of the French Academy of Technology;
- Roseann O'Reilly Runte, president and CEO of the Canada Foundation for Innovation;
- Pascal Viginier, president of the French Academy of Technology and advisor to the chairman of Orange.



4

Appendices

PAGE 84. Review of 2020 calls for proposals
PAGE 86. Review of 2020 calls for proposals -
Credit breakdown by beneficiary type (values and
percentages) **PAGE 90.** Breakdown by education
authority **PAGE 91.** Investments for the Future

Results of 2020 calls for proposals

	Projects peer reviewed in stage 2 or single stage	Projects funded
Component 1: Research and innovation (AAPG)	3,354	1,229
PRC - Collaborative research projects	1,730	661
JCJC - Young researchers	743	353
PRCE - Collaborative research projects involving enterprise(s)	248	114
PRCI - International collaborative research projects	633	101
Component 2: Specific actions outside the AAPG (Flash, Challenges, etc.)	760	191
Flash Covid-19	275	83
Research–Action Covid-19	389	71
Resilience Grand-Est	67	15
PhD programme (AI plan)	29	22
ANRT (CIFRE AI plan)	N/A	N/A
Component 3: Building the ERA and France's international attractiveness	755	246
Specific bilateral calls	158	35
European multilateral calls (within an EC framework)	277	96
Other multilateral calls	147	49
ERC programme	17	17
MRSEI	63	26
AI international attractiveness chairs	93	23
Component 4: Economic impact of research and competitiveness	146	46
ASTRID	109	31
LabCom	25	10
Industrial chairs	12	5
Total for all 4 components excluding Carnot	5,015	1,712

Success rate relative to number of eligible proposals (stage 1 review)	Success rate relative to the number of eligible proposals (stage 2 review or single-stage call)	ANR funding for calls for proposals	Percentage of ANR funding
42.0%	36.6%	€ 499.8 M	80.6%
42.5%	38.2%	€ 314.9 M	50.8%
41.2%	47.5%	€ 89.9 M	14.5%
40.6%	46.0%	€ 66.2 M	10.7%
	16.0%	€ 28.7 M	4.6%
	25.1%	€ 36.2 M	5.8%
	30.2%	€ 10.3 M	1.7%
	18.3%	€ 7.8 M	1.3%
	22.4%	€ 1 M	0.2%
	75.9%	€ 16.4 M	2.6%
	N/A	€ 0.7 M	0.1%
	32.6%	€ 67.4 M	10.9%
	22.2%	€ 15.1 M	2.4%
	34.7%	€ 24.6 M	4.0%
	33.3%	€ 12.7 M	2.0%
	100.0%	€ 1.9 M	0.3%
	41.3%	€ 0.7 M	0.1%
	24.7%	€ 12.4 M	2.0%
	31.5%	€ 16.5 M	2.7%
	28.4%	€ 9.3 M	1.5%
	40.0%	€ 3.5 M	0.6%
	41.7%	€ 3.7 M	0.6%
	34.1%	€ 619.8 M	100.0%

1/2

Results of 2020 calls for proposals

Credit breakdown by beneficiary type (values and percentages)

	Total commitments	CNRS	Inserm	Inria	IRD	INRAE	CEA	Other research bodies	Research bodies subtotal
Component 1: Generic call for proposals (AAPG)	€499,731k 64%	€163,325k 32.7%	€46,721k 9.3%	€5,309k 1.1%	€4,878k 1%	€23,839k 4.8%	€16,245k 3.3%	€17,668k 3.5%	€277,985k 55.6%
PRC - Collaborative research projects	€314,864k 63%	€110,084k 35%	€34,198k 10.9%	€2,494k 0.8%	€3,309k 1.1%	€17,170k 5.5%	€10,702k 3.4%	€11,682k 3.7%	€189,638k 60.2%
JCJC - Young researchers	€89,950k 18%	€29,863k 33.2%	€8,161k 9.1%	€1,982k 2.2%	€1,569k 1.7%	€2,583k 2.9%	€1,105k 1.2%	€3,960k 4.4%	€49,223k 54.7%
PRCE - Collaborative research projects involving enterprise(s)	€66,226k 13.3%	€12,675k 19.1%	€3,141k 4.7%	€331k 0.5%	-	€2,853k 4.3%	€3,527k 5.3%	€1,029k 1.6%	€23,555k 35.6%
PRCI - International collaborative research projects	€28,691k 5.7%	€10,704k 37.3%	€1,220k 4.3%	€503k 1.8%	-	€1,234k 4.3%	€911k 3.2%	€998k 3.5%	€15,569k 54.3%
Component 2: Specific actions outside the AAPG	€36,190k 4.6%	€1,805k 5%	€2,842k 7.9%	€30k 0.1%	€911k 2.5%	€165k 0.5%	€188k 0.5%	€1,811k 5%	€7,751k 21.4%
Research–Action Covid-19	€7,794k 21.5%	€379k 4.9%	€1,183k 15.2%	-	€434k 5.6%	€105k 1.4%	€128k 1.6%	€431k 5.5%	€2,659k 34.1%
Flash Covid-19	€10,262k 28.4%	€1,327k 12.9%	€1,659k 16.2%	€30k 0.3%	€476k 4.6%	€60k 0.6%	€60k 0.6%	€80k 0.8%	€3,692k 36%
Resilience Grand-Est	€995k 2.7%	€99k 10%	-	-	-	-	-	-	€99k 10%
PhD programme (AI plan)	€16,440k 45.4%	-	-	-	-	-	-	€600k 3.6%	€600k 3.6%
ANRT (CIFRE AI plan)	€700k 1.9%	-	-	-	-	-	-	€700k 100%	€700k 100%
Component 3: Building the European Research Area (ERA) and France's international attractiveness	€67,435k 8.6%	€10,682k 15.8%	€4,242k 6.3%	€4,724k 7%	€1,379k 2%	€2,802k 4.2%	€2,883k 4.3%	€2,718k 4%	€29,429k 43.6%
International attractiveness chairs (AI plan)	€12,355k 18.3%	€1,973k 16%	-	€3,273k 26.5%	-	-	€582k 4.7%	-	€5,827k 47.2%
ERC programme	€1,949k 2.9%	€498k 25.6%	€125k 6.4%	€77k 3.9%	-	€99k 5.1%	-	€377k 19.3%	€1,175k 60.3%
MRSEI - Setting up European or international scientific networks	€725k 1.1%	€150k 20.7%	€16k 2.2%	-	-	€63k 8.7%	€30k 4.1%	€30k 4.1%	€289k 39.9%

€1k = €1,000

Universities	Other higher education institutions	Hospitals/ healthcare	Other public sector	Public sector subtotal excluding research bodies	Foundations and associations	SMEs	Mid-market	Large companies	Other private sector	Private sector subtotal
€133,089k 26.6%	€38,987k 7.8%	€2,832k 0.6%	€28,500k 5.7%	€203,407k 40.7%	€4,511k 0.9%	€7,628k 1.5%	€1,650k 0.3%	€2,823k 0.6%	€1,727k 0.3%	€18,339k 3.7%
€79,683k 25.3%	€20,634k 6.6%	€2,444k 0.8%	€19,917k 6.3%	€122,679k 39%	€1,549k 0.5%	€252k 0.1%	€35k 0%	-	€711k 0.2%	€2,547k 0.8%
€25,642k 28.5%	€8,671k 9.6%	-	€5,568k 6.2%	€39,881k 44.3%	€846k 0.9%	-	-	-	-	€846k 0.9%
€18,340k 27.7%	€6,649k 10%	€388k 0.6%	€2,366k 3.6%	€27,743k 41.9%	€2,099k 3.2%	€7,376k 11.1%	€1,614k 2.4%	€2,823k 4.3%	€1,017k 1.5%	€14,928k 22.5%
€9,423k 32.8%	€3,033k 10.6%	-	€648k 2.3%	€13,105k 45.7%	€17k 0.1%	-	-	-	-	17k 0.1%
€18,185k 50.2%	€4,410k 12.2%	€2,304k 6.4%	€1,841k 5.1%	€26,740k 73.9%	€784k 2.2%	€122k 0.3%	€399k 1.1%	€59k 0.2%	€335k 0.9%	€1,700k 4.7%
€2,946k 37.8%	€423k 5.4%	€557k 7.2%	€729k 9.4%	€4,656k 59.7%	€269k 3.5%	-	-	€59k 0.8%	€150k 1.9%	€479k 6.1%
€2,082k 20.3%	€559k 5.4%	€1,671k 16.3%	€1,112k 10.8%	€5,424k 52.9%	€440k 4.3%	€122k 1.2%	€399k 3.9%	-	€185k 1.8%	€1,146k 11.2%
€677k 68.1%	€68k 6.8%	€75k 7.5%	-	€820k 82.5%	€75k 7.5%	-	-	-	-	€75k 7.5%
€12,480k 75.9%	€3,360k 20.4%	-	-	€15,840k 96.4%	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
€17,827k 26.4%	€7,946k 11.8%	€979k 1.5%	€4,898k 7.3%	€31,650k 46.9%	€1,189k 1.8%	€2,591k 3.8%	€1,011k 1.5%	€438k 0.6%	€1,128k 1.7%	€6,356k 9.4%
€2,807k 22.7%	€3,721k 30.1%	-	-	€6,528k 52.8%	-	-	-	-	-	-
€75k 3.8%	€375k 19.2%	-	€324k 16.6%	€774k 39.7%	-	-	-	-	-	-
€348k 48.1%	€88k 12.1%	-	-	€436k 60.1%	-	-	-	-	-	-

2/2

Results of 2020 calls for proposals

Credit breakdown by beneficiary type (values and percentages)

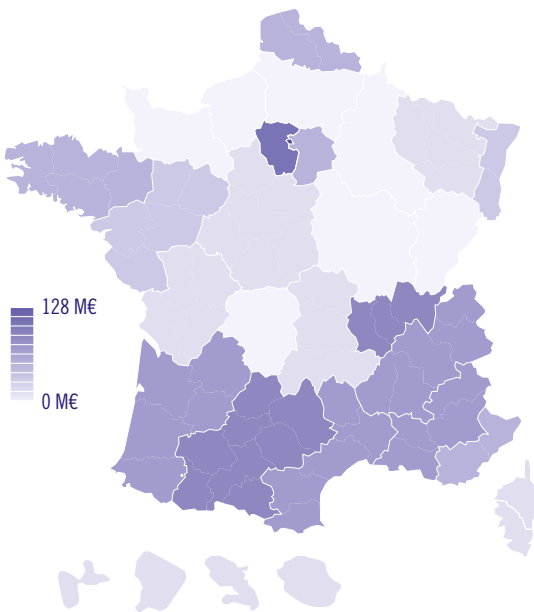
	Total commitments	CNRS	Inserm	Inria	IRD	INRAE	CEA	Other research bodies	Research bodies subtotal
Specific bilateral calls	€15,055k 22.3%	€1,578k 10.5%	€978k 6.5%	€227k 1.5%	€617k 4.1%	€247k 1.6%	€1,270k 8.4%	€1,373k 9.1%	€6,292k 41.8%
Other multilateral calls	€12,744k 18.9%	€3,775k 29.6%	€250k 2%	€245k 1.9%	€508k 4%	-	€363k 2.9%	€55k 0.4%	€5,197k 40.8%
European multilateral calls (within an EC framework)	€24,606k 36.5%	€2,707k 11%	€2,872k 11.7%	€902k 3.7%	€253k 1%	€2,393k 9.7%	€639k 2.6%	€883k 3.6%	€10,649k 43.3%
Component 4: Economic impact of research and competitiveness	€78,470k 10.1%	€6,576k 8.4%	€613k 0.8%	€1,133k 1.4%	-	€6,390k 8.1%	€12,602k 16.1%	€2,177k 2.8%	€29,491k 37.6%
ASTRID	€9,291k 11.8%	€2,536k 27.3%	€263k 2.8%	€133k 1.4%	-	-	€302k 3.2%	€27k 0.3%	€3,261k 35.1%
Industrial chairs	€3,679k 4.7%	€550k 14.9%	-	-	-	-	-	-	€550k 14.9%
LabCom	€3,500k 4.5%	€700k 20%	€350k 10%	-	-	-	€350k 10%	-	€1,400k 40%
Carnot Institutes	€62,000k 79%	€2,790k 4.5%	-	€1,000k 1.6%	-	€6,390k 10.3%	€11,950k 19.3%	€2,150k 3.5%	€24,280k 39.2%
Other funding excluding the 4 components	€98,626k 12.6%	€11,043k 11.2%	€2,761k 2.8%	€1,079k 1.1%	€385k 0.4%	€2,543k 2.6%	€4,084k 4.1%	€40,145k 40.7%	€62,039k 62.9%
Basic Technological Research (RTB)	€3,800k 3.9%	€2,052k 54%	-	-	-	-	€1,748k 46%	-	€3,800k 100%
INCa	€38,000k 38.5%	-	-	-	-	-	-	€38,000k 100%	€38,000k 100%
Preciput	€56,826k 57.6%	€8,991k 15.8%	€2,761k 4.9%	€1,079k 1.9%	€385k 0.7%	€2,543k 4.5%	€2,336k 4.1%	€2,145k 3.8%	€20,239k 35.6%
TOTAL	€780,452k 100%	€193,431k 24.8%	€57,178k 7.3%	€12,275k 1.6%	€7,552k 1%	€35,740k 4.6%	€36,001k 4.6%	€64,518k 8.3%	€406,695k 52.1%

€1k = €1,000

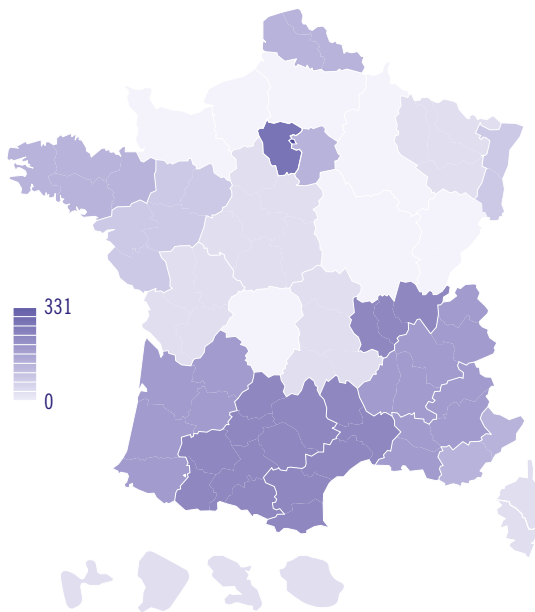
Universities	Other higher education institutions	Hospitals/ healthcare	Other public sector	Public sector subtotal excluding research bodies	Foundations and associations	SMEs	Mid-market	Large companies	Other private sector	Private sector subtotal
€3,243k 21.5%	€1,351k 9%	€233k 1.5%	€1,548k 10.3%	€6,374k 42.3%	€331k 2.2%	€410k 2.7%	€722k 4.8%	€225k 1.5%	€701k 4.7%	€2,389k 15.9%
€4,603k 36.1%	€1,279k 10%	-	€1,159k 9.1%	€7,041k 55.2%	€506k 4%	-	-	-	-	€506k 4%
€6,750k 27.4%	€1,133k 4.6%	€747k 3%	€1,866k 7.6%	€10,496k 42.7%	€352k 1.4%	€2,180k 8.9%	€289k 1.2%	€213k 0.9%	€427k 1.7%	€3,461k 14.1%
€6,788k 8.7%	€13,550k 17.3%	€2,690k 3.4%	€7,044k 9%	€30,073k 38.3%	€8,339k 10.6%	€1,380k 1.8%	€981k 1.3%	€446k 0.6%	€7,760k 9.9%	€18,907k 24.1%
€2,608k 28.1%	€1,311k 14.1%	-	€514k 5.5%	€4,433k 47.7%	€139k 1.5%	€770k 8.3%	€141k 1.5%	€446k 4.8%	€100k 1.1%	€1,597k 17.2%
€690k 18.8%	€1,629k 44.3%	-	-	€2,319k 63%	€810k 22%	-	-	-	-	€810k 22%
€1,400k 40%	€350k 10%	-	€350k 10%	€2,100k 60%	-	-	-	-	-	-
€2,090k 3.4%	€10,260k 16.5%	€2,690k 4.3%	€6,180k 10%	€21,220k 34.2%	€7,390k 11.9%	€610k 1%	€840k 1.4%	-	€7,660k 12.4%	€16,500k 26.6%
€24,279k 24.6%	€8,139k 8.3%	€486k 0.5%	€3,174k 3.2%	€36,077k 36.6%	€487k 0.5%	-	-	-	€22k 0%	€509k 0.5%
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
€24,279k 42.7%	€8,139k 14.3%	€486k 0.9%	€3,174k 5.6%	€36,077k 63.5%	€487k 0.9%	-	-	-	€22k 0%	€509k 0.9%
€200,168k 25.6%	€73,030k 9.4%	€9,291k 1.2%	€45,457k 5.8%	€327,947k 42%	15,310k 2%	€11,720k 1.5%	€4,041k 0.5%	€3,766k 0.5%	€10,973k 1.4%	€45,810k 5.9%

Breakdown by education authority

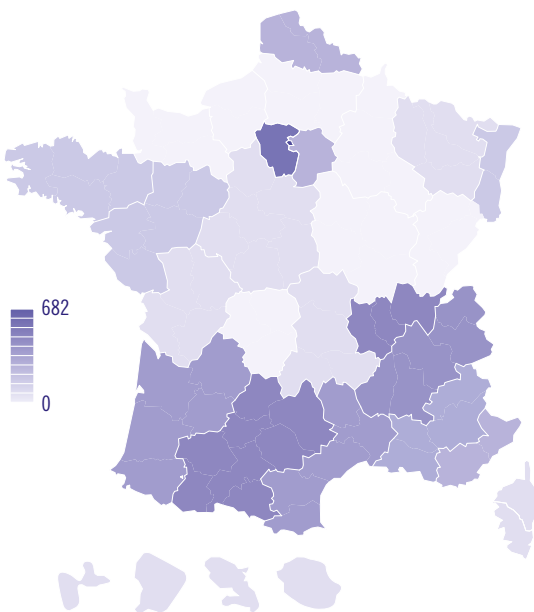
Partner funding by education authority (4 components)



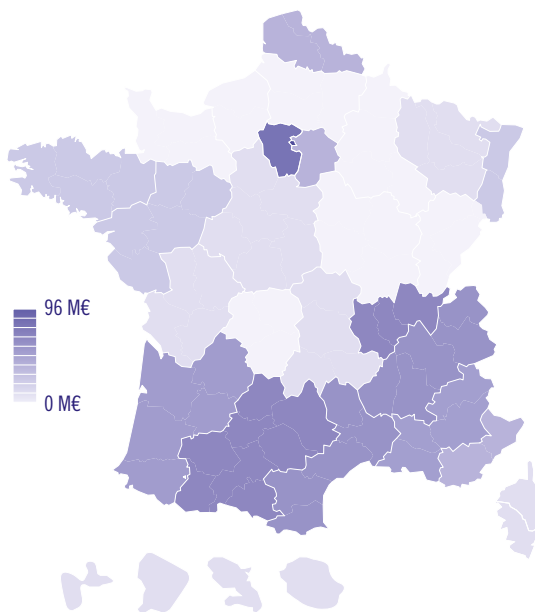
Number of coordinators per education authority (4 components)



Number of partners per education authority (4 components)



Partner funding by education authority (AAPG)



Investments for the Future



PIA financial elements*

Total amount authorised	€13,862,204,053
Total amount under contract	€13,507,053,581
Total amount disbursed	€10,264,337,223

Excluding Campus and Saclay. () Including the non-consumable grants for the 4 fully certified IDEX projects.*

Breakdown of project funding by region as of 31/12/2020

Main region of project	Number of projects	Total authorised*	Total agreed	Total disbursed	Remaining to be disbursed
Auvergne-Rhône-Alpes	133	€1,674,657,381	€1,629,583,095	€1,138,476,690	€536,180,690
Bourgogne-Franche-Comté	17	€188,884,803	€178,578,467	€98,616,493	€90,268,310
Brittany	28	€435,587,933	€431,949,823	€280,010,536	€155,577,397
Centre-Val de Loire	10	€70,117,061	€69,504,291	€43,002,618	€27,114,443
Overseas	1	€6,000,000	€6,000,000	€540,000	€5,460,000
Grand Est	51	€1,530,319,332	€1,453,030,303	€1,314,035,146	€216,284,186
Hauts de France	38	€480,966,139	€480,950,596	€343,236,487	€137,729,653
Île-de-France	330	€5,396,151,426	€5,283,470,647	€3,841,829,869	€1,554,321,558
Normandy	14	€104,143,856	€104,115,893	€69,797,598	€34,346,257
Nouvelle Aquitaine	54	€1,270,624,666	€1,223,032,567	€1,080,879,638	€189,745,028
Occitanie	73	€959,368,152	€948,541,670	€683,319,078	€276,049,074
Pays de la Loire	20	€308,999,720	€305,093,164	€157,414,807	€151,584,913
Provence-Alpes-Côte d'Azur	53	€1,403,854,430	€1,367,273,910	€1,188,728,264	€215,126,166
TOTAL	822	€13,829,674,898	€13,481,124,426	€10,239,887,223	€3,589,787,675

Excluding Campus and Saclay/excluding CVT () Including the non-consumable grants for the 4 fully certified IDEX projects.*

Breakdown of project funding by action as of 31/12/2020

Action name	Number of projects	Total authorised*	Total agreed	Total disbursed	Remaining to be disbursed
Bioinformatics	12	€17,130,081	€17,130,080	€16,719,880	€410,201
Biotechnology and Bioresources	13	€88,275,408	€87,971,110	€74,306,294	€13,969,115
Cohorts	13	€100,071,399	€100,067,403	€67,494,026	€32,577,373
Thematic Development Consortia	6	€32,529,155	€25,929,155	€24,450,000	€8,079,155
Alternative Approaches to Cultivation and Protection	10	€26,972,869	€0	€0	€26,972,869
Demonstrators	4	€90,693,735	€90,693,735	€70,916,635	€19,777,099
Development of Experimental Digital Universities	5	€8,000,000	€8,000,000	€7,200,000	€800,000
Graduate Schools of Research	35	€270,428,509	€270,428,509	€50,400,489	€220,028,020
Equipment of Excellence	93	€591,902,706	€591,393,424	€564,510,872	€27,391,833
Equipment of Excellence 2	5	€157,000,000	€157,000,000	€94,983,448	€62,016,552
Additional Experimentation by SATTs	7	€22,250,000	€19,500,000	€8,300,000	€13,950,000
Hybridisation in Higher Education	15	€21,709,000	€16,056,100	€8,454,400	€13,254,600
IDEX/I-SITE	86	€1,276,404,416	€1,274,587,610	€853,183,968	€423,220,448
Infrastructure	23	€579,102,629	€579,091,687	€461,264,034	€117,838,595
Initiatives of Excellence	101	€4,888,577,467	€4,814,925,924	€4,663,799,277	€224,778,190
Initiatives of Excellence in Digital Education	12	€12,290,000	€12,290,000	€11,316,658	€973,342
Initiatives of Excellence in Innovative Training	20	€101,800,000	€101,800,000	€80,060,407	€21,739,593
Carnot Institutes	55	€136,216,771	€136,216,771	€105,374,441	€30,842,330
Convergence Labs	10	€103,136,000	€103,136,000	€44,704,433	€58,431,567
Technological Research Institutes	8	€1,119,804,227	€1,119,804,227	€686,695,672	€433,108,555
Institutes of Excellence in Low-Carbon Energy	13	€384,732,225	€383,655,996	€257,145,953	€127,586,272
Research Hospitals	6	€423,329,166	€423,329,163	€342,486,023	€80,843,143
Research Hospitals 2	1	€50,000,000	€50,000,000	€10,000,000	€40,000,000
Research Hospitals B	6	€35,000,000	€35,000,000	€34,627,292	€372,708
Research Hospitals B 2	3	€15,000,000	€15,000,000	€5,400,000	€9,600,000
Interdisciplinary Institutes of Artificial Intelligence	4	€88,000,000	€74,500,000	€18,900,000	€69,100,000
Integration and Development of IdEx and ISITE	11	€172,000,000	€0	€0	€172,000,000
Boarding Schools of Excellence and Equality of Opportunity	1	€900,000	€900,000	€855,000	€45,000
Laboratories of Excellence	43	€615,911,559	€615,911,559	€395,899,642	€220,011,917
Make Our Planet Great Again	41	€26,889,303	€24,641,203	€12,538,060	€14,351,243
Nanobiotechnology	8	€18,958,714	€18,923,997	€17,171,027	€1,787,687
New University Curricula	36	€325,900,000	€325,897,569	€71,473,208	€254,426,792
Tomorrow's Nuclear	1	€599,000,000	€599,000,000	€215,300,000	€383,700,000
Hospital University Oncology Research Cluster (PHUC)	2	€20,000,000	€20,000,000	€19,813,478	€186,522
University-Hospital Research in Health	39	€306,562,724	€302,585,644	€163,664,151	€142,898,573
Technology Transfer Acceleration Companies	14	€810,305,000	€810,305,000	€736,262,172	€74,042,828
Very High Performance Sport	6	€18,275,549	€4,385,455	€2,545,814	€15,729,735
Structuring of research-based training in initiatives of excellence	12	€222,149,000	€192,000,000	€0	€222,149,000
Nuclear Safety	22	€67,476,441	€67,476,261	€57,984,469	€9,491,972
European Universities	20	€17,070,000	€17,070,000	€8,136,000	€8,934,000
TOTAL	828	€13,862,204,053	€13,507,053,581	€10,264,337,223	€3,597,866,830

Excluding Campus and Saclay. (*) Including the non-consumable grants for the 4 fully certified IDEX projects.
(**) Including Labex and Idefi projects within the scope of the projects concerned



Publication director: Thierry Damerval

Editorial design and coordination:

ANR, Information and Communication Division
French National Research Agency – 50, avenue Daumesnil – 75012 PARIS – Tel.: +33 (0)1 78 09 80 00

Editorial design: Kogito - L'agence éditoriale

Graphic design and creation: EFIL - www.efil.fr

Photo credits: Adobe Stock, ANR, Bertrand Guigou, DR, Getty Images, MESRI, XR PICTURES.

We would like to thank all the ANR staff who have contributed to the preparation of this report.

Production: Quarante Six Electrogeloz - Ivry

This document is printed by an Imprim'vert-certified company using plant-based inks on PEFC™-certified paper.™

"Free copy, not for resale"

anr®

 www.anr.fr

 [@agencerecherche](https://twitter.com/agencerecherche)

 [ANR](https://www.linkedin.com/company/ANR)

anr.fr