Photograph the image using the Pixee application to access the content online. Pixee is a free application, which is available on iPhone, Android and BlackBerry.

How does it work? Mobile phones are equipped with a built-in camera for taking photos... but not just photos. Mathematical formulae developed recently within Inria allow mobile phones to decipher the content of images like the human brain does. Thus, the phone compares the image captured with several thousand images to identify the closest one and to provide us with the information.

Digital technology at the heart of our lives
As the printing press, the telephone and railways did in the past, digital technology is massively changing our homes, our businesses, our industries and our schools by broadening the options for communication, by automating certain tasks in order to increase productivity and by inventing new ways of exchanging information.

2011, at the heart of Inria
The research landscape is constantly evolving. The institute’s management and researchers talk about the past year.

Key figures
From the point of view of Michel Cosnard, Claude Kirchner and Hervé Mathieu.

Assignments
Research, partnerships, technology transfer and the spread of digital sciences.

Coordination
The challenges of modernisation, the eight research centres.

Research at the heart of the debate
The increasing importance of digital technology in everyday life, whether in a visible and tangible or invisible and intangible manner, raises many questions.

We are all stakeholders in regulation
Isabelle Falque-Pierrotin, President of the French National Committee for Data Protection (CNIL).

Fertile disorder
Daniel Kaplan, CEO of the Next Generation Internet Foundation (FING).

Let researchers research!
Henri Verdier, President of the Cap Digital competitiveness cluster.
Digital technology now forms a central part of our everyday lives. It can be found in the majority of objects and services that we use every day, including the Internet, computers, mobile phones, cameras, portable music players, televisions, game consoles and GPS receivers, but it is also hidden away, sometimes in a less visible manner, in vehicles, industrial tools, medical devices, decision support systems, etc. In the space of barely a few years, all these technologies have already profoundly changed our lives, to the point of becoming indispensable. They will continue to do so in the future, thanks to applications that are currently being developed. This is the route taken by researchers at Inria, a public research body, which is inventing the digital world of the future.
How should we handle this overdose?

It is well known that too much information can be as useful as no information at all. The fact that we have access to knowledge does not necessarily mean we are fully benefiting from it. With the development of digital technologies and the democratisation of communication tools, we are now swamped with information of all kinds, which is becoming increasingly difficult to analyse, rank and store. Huge numbers of e-mails, tweets and other messages circulate everyday on networks and even the most minor request via a search engine returns dozens of web pages, all of which represent sources of information that need to be patiently explored. What are we supposed to do, given that our brains cannot absorb everything?

Numerous Inria teams are carrying out research aiming to organise and clarify this ever-increasing mass of data, in order to make it usable and understandable for everyone. This is precisely the case of the Orpailleur project-team, which is developing smart tools for managing and extracting knowledge from databases, or of Aviz, which is working on new ways of visualising and summarising information while browsing through large masses of data, by focusing on contextualising it.
Digital technology at the heart of our lives
The target is zero defects

On 4th June 1996, Ariane 5 exploded in mid-air during its inaugural flight. The cause was a simple bug in one of the pieces of software managing the rocket’s autopilot. In fact, in computer sciences, the smallest design error can have disastrous human or economic consequences, above all when this involves a critical embedded program, like those within control aerospace, nuclear, medical or automotive systems.

To prevent this kind of accident occurring, several Inria teams, specialising in algorithms and programming, have devoted themselves to the issue of software reliability by developing tools designed to track down faults in programs, from the design phase onwards. Thus, Abstraction has developed Astrée, a code analyser that is able to detect errors by performing automatic calculations. Gallium is seeking to improve the reliability of software thanks to Objective Caml, a high-level programming language, which is more reliable and expressive, and CompCert, a compiler that faithfully translates source code, without introducing any errors. Numerous ongoing projects, making use of powerful computing and mathematical concepts, have the same goal: to make software perfectly reliable, whether it is used for navigation, control, automation or communication. For the sake of all our safety!
Digital technology at the heart of our lives
Virtual technology for surgeons

Preparing for an operation using a computer simulation, or even performing an operation by superimposing additional information within the surgeon’s field of vision; these practices, which appear to come straight from a science fiction novel, could actually become commonplace in the near future. This is due in particular to augmented reality, a technique that allows the surgical field to be enhanced by adding information such as 3D models of organs or vessels, therefore enabling specialists to see beyond what is actually visible, in order to better guide their actions.

The Shacra team is working on this topic within MIX-Surg, one of three university hospital institutes (IHU) with which Inria has formed a partnership, of the six selected as part of the Future Investments programme launched in 2010. As for the Magrit project-team, it is working on faithful digital representations of the vascular network and on simulations of organs. By combining imaging, simulation, modelling and even robotics (automating and improving the reliability of certain technical operations), these approaches should significantly improve minimally invasive surgery and help to advance medicine and patient comfort.
Digital technology at the heart of our lives
Progression towards smart cities

More than half the world’s population now lives in an urban environment, and this trend is set to intensify over the course of this century. In order to adapt to this profound change and its social and environmental effects, cities need to revise their infrastructures and services by taking maximum advantage of the opportunities offered by digital systems and new technologies. Numerous smartphone applications are already showing the way by using Internet connections, for example, to allow you to find out, in real time, the location and arrival time of the bus you are waiting for, or the address of a restaurant in an area you are unfamiliar with. Nevertheless, there is still a great deal to do to really make cities smart, in particular by providing residents with the means to sustain contextual information networks, which are of use to everyone.

Inria is devising and preparing for this change. The Wam project-team has developed an augmented reality application allowing users to visit Grenoble with the benefit of additional visual and audio information on a smartphone. By using web geolocation data and wireless communication technologies, including wi-fi, 3G telephony and RFID tags on devices, a multitude of interactive services designed to assist disabled people, guide motorists and provide users with information, will soon be available in digital cities.
Digital technology at the heart of our lives
By 2020, Europe will be home to almost 84 million people above the age of 75. With steadily increasing life expectancy and eroding family and social ties, increasing numbers of elderly people are finding themselves completely isolated, and not everyone is able to make use of home help services to assist them with their day-to-day activities. This is a problem also encountered by disabled people, who are forced to perform all kinds of “tricks” in order to carry out everyday tasks. What if solutions could be provided by digital technology and robotics?

As part of the large-scale PAL initiative (Personally Assisted Living), Inria has devoted nine teams, spread across its research centres, to developing solutions to improve the lives of dependent people. The Coprin project-team has therefore developed Marionet-Assist, an automated system allowing people with reduced mobility to get out of a chair or to get up after a fall (the most common accident). E-motion is exploring artificial systems with sufficiently advanced perception, decision-making and action capabilities to interact with humans, and Maia is working on stand-alone machines with artificial intelligence, allowing us to imagine, one day, genuine domestic robots that are able to help us in our daily lives.
The art of sharing electricity

Everyone is now aware that energy is precious and that managing it is a major challenge for the 21st century, in both economic and ecological terms. Faced with the intrinsic limits of fossil resources, there is a need for new production and consumption patterns, favouring and exploiting renewable energies, including solar, hydraulic and wind power. Nowadays, private individuals and companies are able to produce electricity and use it for their own needs or sell it on to a national operator, in order for it to be shared. However, in order for the system to work and develop, powerful digital tools are needed to manage this real-time distribution via smart grid type networks.

Inria is working towards this goal by means of the Metis I-Lab, a joint structure bringing together the company Artelys and the Tao and Maxplus project-teams. Within this joint laboratory, researchers and industrial operators are pooling their resources and expertise to create a smart grid-based energy management system. Specialising in optimisation, statistics and decision support systems, Artelys uses the teams’ research into algorithms and modelling, in order to speed up the development of operational solutions to be offered to clients in France and around the world.
Digital technology at the heart of our lives
Indiscretions on the Internet

On the net, everyone believes they are safely hidden behind a pseudonym. However, a study by the MIT (Massachusetts Institute of Technology), involving Inria researchers, reveals that the majority of Internet users have the same user names on the various web sites that they visit. With the development of social networks and e-commerce, it is relatively easy to connect these virtual identities in order to target, track and even identify users for commercial, political or criminal purposes. At a time when the Internet and digital communication are at the heart of society, the question of the security and confidentiality of personal data is crucial, in terms of both privacy and sound functioning of the economy.

Around fifty Inria teams are currently working on this topic, which is a major challenge in this era of communication. Some of them, including Secsi and Caramel, are concentrating on protocols and encryption keys allowing the confidentiality of information exchanges to be guaranteed. Others, such as Planete, are examining security gaps in popular communication software and the anonymity of user names. The Secret project-team has been involved in the development of Shabal, an algorithm allowing the encryption standards for confidential data to be tested. These are so many avenues to explore, methods to invent and tools to be developed in order to make use of digital technology in a completely safe environment.
Digital technology at the heart of our lives
Digital technology lies at the heart of our society, in our homes, of course, but also in our schools, companies and industries. As the printing press, the telephone and railways did in the past, digital technology is massively changing our economy by broadening the options for communication, by automating certain tasks in order to increase productivity and by inventing new ways of exchanging information.

Although digital technology still relies on physical devices (processors, computers, servers, networks, etc.), it also gives a proper value to intangible aspects, whether these are cultural assets (music, cinema, etc.), services or intellectual creation. The same applies to software tools. What’s more, digital technology is changing the economic landscape by significantly reducing the cost of innovation, as illustrated by the story of e-commerce platforms and social networks.

A study by Coe-Rexecode, published in May 2011, estimates that the digital economy was on average responsible (directly and indirectly) for 26% of growth in France between 1980 and 2008, 32% in Germany and Japan and 37% in the United States. This proves its importance and shows the potential for growth that is yet to be exploited in France.

Inria is playing an active part in this change with its research and technology transfer projects, in particular by means of I-Labs, joint structures combining teams of researchers and SMEs-SMIs within joint laboratories to work on industrial projects.
STRATEGY

Key figures

7
start-up created.

4,432
reference publications.

106
software applications submitted to the APP (France’s software protection agency).

23
initial patents filed.

179
project-teams (on 1st January 2012), 83% of which are joint teams with universities and other research institutions.

4,351
people who have contributed to Inria’s assignments, of which 68% are scientific personnel.

1,282
PhD students within research teams.

66
teams linked to foreign universities and laboratories.

304
theses produced.
“INCREASING THE IMPACT OF OUR RESEARCH IS VITAL”

Michel Cosnard, Chairman and CEO
In 2011, the institute established new sites in Bordeaux, Lille and Saclay, as well as opening the PCRI in Saclay. How are you managing to go ahead with these developments against the background of a freeze on state funding?

Michel Cosnard • On the one hand, by means of an increase in our own resources, largely associated with the success of our teams in terms of calls for projects, and on the other hand, by means of improved efficiency in terms of their use, with the aim of achieving excellence in the field of management. Our first edition of the Inria awards also perfectly reflects these two aspects.

The French research landscape has changed a great deal. How have these changes affected the institute?

M. C. • In 2011 we saw the first full year of Allistene – a dedicated consultation structure for digital science and technology, which brings together the French Atomic Energy Commission (CEA), the French National Centre for Scientific Research (CNRS), the Institut Mines-Télécom, the French Conference of University Chancellors (CPU), the Conference of the Heads of French Engineering Schools (CDEFI) and our institute – and the year in which numerous future investments were initiated. The creation of Allistene provides proof that digital sciences are a priority for our country, in the same way as health, energy, the environment and human and social sciences. This alliance has allowed us to strengthen our partnerships and to define the national priorities for digital science and technology in a concerted manner. The Future Investments programme has also provided the opportunity to launch new partnership activities, in particular in the fields of health, the environment and human and social sciences. Many of our research teams are involved in laboratories of excellence (Labex) and excellence-in equipment (Équipex) projects with local academic partners. As a national institute, Inria has partnerships with three university hospital institutes (Paris, Strasbourg and Bordeaux), and, as part of the digital economy programme and even technology research institutes (IRT), our partners are industrial operators, major groups and SMEs.

European research has also been booming since the creation, in 2010, of EIT ICT Labs, for which Inria coordinates the research arm. Where do we stand now?

M. C. • EIT ICT Labs, one of the European Institute of Innovation and Technology’s (EIT) three knowledge and innovation communities devoted to digital sciences, is taking shape and looks very promising. It should allow a bridge to be built between research and industry by funding innovation, as far as actual
technological development – including patent applications, software, start-up companies and other technology transfer methods. Its two strengths are: joint programming (the 23 partners propose research topics and fund them with European support) and a new global approach incorporating education, research, innovation and uses, one of the variants of which could, for example, be training for new student profiles, both scientists and entrepreneurs.

Do these developments influence your research subjects?

M.C. • Our research retains a certain continuity and is in keeping with the burgeoning development of digital technologies. In this “world under construction”, we are particularly attentive to increasing the impact of our research. We are increasingly interested in uses, an approach that encompasses studying social networks, – whether this is for privacy protection or the right to oblivion – the Internet of objects, human-machine interaction and home help, as well as issues relating to sustainable development.

This is why we are in close contact with major economic and social players in the digital world. We have also asked three of them to contribute on the following pages.

2011 Inria Awards

“The first emblematic embodiment of our approach”

“The purpose of the Inria Awards is to recognise and reward scientists who have made an outstanding contribution in the field of computer sciences and mathematics, or who have made major contributions to technology transfer or innovation in these fields. They also recognise engineers or technicians who have made a notable contribution in terms of support or backing for research. In 2011, the Grand Prize was awarded to Gérard Huet, a pioneer from the French school of computer science, whose work has been crucial in terms of guaranteeing the quality of software. The Young Researcher Award highlighted the talent of Bruno Lévy, a geometry enthusiast who is radically changing 3D representation for both computer game graphics and computer simulation images. The Inria-Dassault Systèmes Award for Innovation recognised Stéphane Donikian, the creator of the spin-off Golaem and its digital human behaviour simulators in 3D environments. The Award for Research and Innovation Support was won by Julien Wintz, a young engineer who has established and leads a scientific computing platform allowing researchers to test their software in their fields of application. Finally, the Research Support Department Award recognised the outstanding teamwork that contributed to certification of the institute’s accounts, the first stage in the process of simplifying and harmonising practices within Inria.”
“Initial observation: the appropriateness of the fundamental principles, around which the institute was built, as set down by the first chairman of Inria, Jacques-Louis Lions, in 1979. More than forty years later, they are still relevant, whether this lies in the combination of computer science and mathematics, the importance of technology transfer to industry, the structure of research in small and responsive project-teams, education/training by welcoming PhD students and young engineers or international openness. Over the course of the years and successive chairmen, this has been demonstrated by the creation of start-up, involvement in various European programmes and the establishment of lasting partnerships, such as the Ercim organisation, involvement in W3C since the inception of the web, numerous subcontracting activities, strong international relationships and even the stringent assessment of research teams. All these aspects are summed up perfectly by the motto for the institute’s first strategic plan, in 1994: scientific excellence and technology transfer.

Second observation: the ambitious plan to double Inria’s activities and resources (staff and budgets) in ten years, driven by Bernard Larrouiturou (Chairman from 1996 to 2003), with the aim of taking the institute to the highest global level, formalised by the agreement concluded with the government in 2000, has been an undeniable success. Proof of this is provided by the international Visiting Committee, which, having evaluated the institute at the end of 2008, rated it as the European leader and one of the world’s best research organisations in its field. Another telling indicator is the large number of grants that our researchers obtain from the European Research Council (ERC).

While maintaining this strategy, our aim is to further open up our research to industry and society, on the one hand, by incorporating social and environmental issues into our research, as we have done in the past for telecoms and life sciences, and on the other hand, by playing the role of a catalyst for research and a facilitator of projects, in order to support strong partnerships with universities, schools and businesses. Yet, there is still a great deal to be done for computer science to be recognised not only as a tool but also as a science in its own right.”
ASSIGNMENTS

... FROM THE POINT OF VIEW
OF OUR RESEARCHERS

RESEARCH

PARTNERSHIPS

TECHNOLOGY TRANSFER

THE SPREAD OF DIGITAL SCIENCES
ASSIGNMENTS
... from the point of view of our researchers

On completion of her engineering studies at the Insa in Lyon, where she specialised in networks and telecommunications, Nathalie Mitton joined the Pops project-team. As an Inria Research Scientist, she now leads the brand new Fun team, which is examining heterogeneous networks of communicating objects.

“Having been attracted to science since my childhood, I studied as an engineer at the Insa in Lyon. As I had chosen to specialise in networks and telecommunications, I continued with a thesis on wireless networks within the framework of CITI, an Insa laboratory which was working in partnership with Inria. This research really fascinated me and I wanted to continue within Inria. In 2006, I joined the Pops project-team, where I gradually took on responsibilities, before setting up the Fun team, which will extend its work on future ubiquitous networks from 2012 onwards. We are actually aiming to develop and unify networks of RFID tags, sensors and robotic actuators, which are battery-operated and communicate wirelessly using radio waves. Numerous applications have already been envisaged, in particular in the environmental field: for example, detecting forest fires using temperature sensors, monitoring air or water pollution and even studying the behaviour of groups of animals by fitting them with sensors. What I like about Inria is its openness: dialogue with other regional research centres, relationships with numerous researchers around the world and close contacts with industry. We have concluded an external research agreement (CRE) with France Télécom, and created the EtiPops I-Lab with the local SME Etineo. This joint structure, within which we are working on geolocation, has a number of advantages: it allows us to pool our resources, define our research with a 3-year road map and set ourselves industrial goals, with the creation of products, which is a way of giving our research a highly visible form.”

Nathalie Mitton, Fun Team Leader, Lille - Nord Europe Research Centre

“Working with companies on industrial projects”
Rémi Gribonval, Inria Senior Research Scientist, Rennes - Bretagne Atlantique Research Centre

“My research combines my two favourite subjects: music and mathematics”

“It was my love of mathematics that drew me to ENS, and my love of music that led me to choose a master’s degree combining the two. I continued in the same vein by writing a thesis on sound processing with the IRCAM and the École Polytechnique. I subsequently left to take up a post-doctoral position at the University of South Carolina in the United States, where I studied the theoretical aspects of the algorithms I was using in greater depth. Since I was invited to join the Metiss team in 2001, I have been exploring the notion of parsimony, which specifically allows audio signals to be represented and processed with very few parameters. The resulting techniques allow audio data to be compressed, voices to be isolated and instruments to be separated within a recording, for instance. However, my research goes far beyond just sound, with applications for medical imaging, biology, astronomy and, even more broadly, machine learning. Some of these have already been examined within the framework of Small and Échange, two projects that I coordinated, one a European project and the other for the ANR (the French National Research Agency). These are just some of the many avenues to be explored with the team, which I will soon be leading.”

François-Xavier Le Dimet, Professor Emeritus at Joseph-Fourier University, Grenoble - Rhône-Alpes Research Centre

“Inria has trusted me to continue my research”

“Francois-Xavier Le Dimet is conducting his research within the Moise project-team, which has taken over the Idopt project, for which he was responsible. He also teaches at Florida State University and has just been appointed a fellow of the American Meteorological Society.

“The life of a researcher is made up of encounters. I owe a great deal to Jacques-Louis Lions, the Chairman of Inria at the beginning of the 1980s. I attended his classes for my post-graduate diploma in numerical analysis and he has always actively and wholeheartedly supported me in my research. This human dimension has been vitally important, as have the discussions I have had with other scientists on my travels to the United States, Russia, China, etc. Jacques-Louis Lions’ optimal control theory also formed the basis for my concept of a data assimilation method, which was of interest to meteorologists. Initially, this approach was faced with the limited computational capacities of computers at the time, but it has since been adopted by the majority of weather centres around the world, thereby helping to improve their forecasts. At present, I am continuing to develop it within the Moise team, by specifically attempting to make use of the dynamic information provided by satellite images. However, the question of a link between data gathered by observation and mathematical models representing complex phenomena clearly has implications for areas other than climate, such as oceanography, hydrology, biology and even petroleum research.”
ASSIGNMENTS
... from the point of view
of our researchers

Michel Banâtre,
Inria Senior Research Scientist,
Rennes - Bretagne Atlantique Research Centre

“Carrying out original
research in direct
contact with the world
of business”

Michel Banâtre has conducted
numerous projects with
the LSP, Solidor and Aces
teams, focusing his research
on distributed systems, fault
tolerant architectures and
ambient computing. Guided by
the constant goal of technology
transfer, he is behind the filing
of twenty or so patents, the
establishment of numerous
large-scale collaborations with
industrial partners and the
creation of two start-up.

“I took my first steps in
research as an engineer at
the University of Rennes 1,
where I studied for my
entire degree in the field
of computer science, which
had just been born at the
beginning of the 1970s,
before becoming a senior
research scientist for Inria,
in 1986. I like research that
is off the beaten track,
research that allows the
systems and services
of the future to be shaped.
However, I am still convinced
of the need for technology
transfer as a means to
validate the results of
research. For many
researchers, the promotion
of a scientific idea often
ends with a list of the
publications it may have
generated. For my part,
I want to see it tested in
a real environment, or even,
where possible and relevant,
for industrial use. Obviously,
we shouldn’t hesitate
to immerse ourselves in our
chosen areas of application
and not ignore issues
surrounding industrial
protection rights, including
patents and prototyping.
This is what has guided my
entire career as a researcher,
and what still drives me. My
first experience in this area
dates back to 1979-1985,
with the Enchère system,
a perfect example of my
approach. My aim was
to apply the principle of
distributed systems, which
I had been studying as part
of my doctoral thesis, to
auctions held by fruit and
vegetable producers in my
native Brittany. Undertaken
in close cooperation with
local cooperatives, this
project formed the subject
of a technology transfer
with an SME based in
Rennes, but did not result
in it being marketed. This
was where I really began
to understand the difficulty
of turning a great idea into
a commercial solution, but
I persevered with Bull, Texas
Instruments and Alcatel-
Lucent in the field of
architectures and systems.
Similarly, my research on
ambient computing has
formed the subject of a
technology transfer to the
JCDecaux Group. More
recently, my work on paired
physical objects has allowed
me to tackle the issue of
reliable traceability within
logistics, with all its
potential applications in
sectors as varied as luxury
goods and medical items.
My approach is not opposed
to more academic research.
In my opinion, it should go
without saying when the
concepts or tools proposed
by researchers could form
part of industrial solutions,
or even be the products
of the future.”
Catherine Bonnet,
Disco Team Leader,
Saclay – Île-de-France Research Centre

“Exchanging ideas with others opens our minds”

As an Inria researcher and leader of the Disco team, which comprises around fifteen members, Catherine Bonnet is working on the analysis and control of interconnected systems in complex environments. Being extremely committed to scientific mediation, she is also a member of the board of the ‘Femmes et mathématiques’ association.

“After completing my secondary education, I studied mathematics, because I liked it, without any idea of where it would take me. I continued with a thesis on the modelling of helicopter rotor blades for Aérospatiale. When I arrived at Inria in 1994, I worked on an engine control issue for Renault. This experience helped me to understand the challenges of theoretical research and exact methods, which allow generic models and tools for resolving specific problems to be developed. Since then, I always think of potential applications even when my research appears very abstract. Therefore, as part of Disco, which relates to the analysis and control of interconnected systems in complex environments, we are working on acute myeloid leukaemia, a specific form of this cancer. We are working in partnership with a doctor from the Saint-Antoine hospital and his team of biologists, who are helping us to test and refine the models we are developing. Within the institute, I also like being in close contact with all kinds of scientists, on trips, at conferences or on the premises of Supélec, where we are based, as we know that exchanging ideas opens our minds and sustains us. I also take part in outreach activities for mathematics and research, by explaining to young girls that these fields are not incompatible with life as a woman, and that they are not forced to cut themselves off from the outside world, as is still too often the perception.”

Martin Hachet,
Potioc Team Leader,
Bordeaux – Sud-Ouest Research Centre

“Making interactive 3D technologies accessible to everyone”

From the University of Bordeaux, Martin Hachet joined the institute to take part in the Iparla project. As an Inria research scientist, he is currently leading the brand new Potioc team, which is developing interactive 3D technologies for use by the general public.

“Initially attracted to the audiovisual sector, I began studying computer science rather by chance. I rapidly recognised the creative potential of this science: you start from scratch and shape everything! During the course of my thesis on virtual reality, I produced a device allowing manual actions to be performed using 3D objects displayed on a large screen. However, the solutions available at that time, mainly developed for the automotive and aeronautical industries, required complex and expensive devices. What is driving my current research is precisely the desire to make these tools accessible to as many people as possible, in order for everyone to be able to use them intuitively. I have been working along these lines within the Iparla project, where we have made use of the touch-screen interfaces of tablets and smartphones to redefine human-computer relations within mobility situations. I am hoping to go further with Potioc, by exploring new ways of manipulating 3D images while placing greater emphasis on the pleasure of use, in particular in the fields of art, culture, education and even personal assistance.”
The institute has identified and is responding to new scientific and social challenges. Furthering knowledge and developing technological expertise and its effects is crucial for the research community and industrial operators.

Digital systems, which have permeated all aspects of our professional and private lives, are at the heart of our modern society. “We are working on numerous aspects associated with this revolution, which is frequently only perceived by users,” recalls Pascal Guitton, “but our role is also to produce breakthrough research, which tackles new challenges that are often hard to identify on the face of it.” We specifically examine these new subjects with Heads of Science and Deputy Scientific Directors, by setting up meetings between researchers on shared topics, for example.

**Generating new research topics**

“In 2011, we organised three national seminars on cross-disciplinary topics, he adds. Researchers swap ideas and work together for several days. New connections and even, occasionally, new multidisciplinary projects emerge.” Thus, fifteen or so people met to discuss their work on brain-computer interfaces; devices that allow computers or machines to be controlled on the basis of measurements of the brain’s electrical activity. Although it is still at the early exploratory stage, this research will, one day, allow severely disabled people to access part of the digital world (games, virtual museums, etc.). In addition, Inria has independently organised days designed to present the results of various joint scientific actions. These talks have generally only been attended by a small number of researchers. To increase their visibility, scientific workshops covering all incentive actions were organised for the first time...
For the majority of audiovisual and multimedia applications, as for telecommunications, standardisation is essential to guarantee interoperability between equipment developed by industrial operators. As soon as a new technology emerges, like 3D television did recently, a group of industrial operators takes the initiative (in this case MPEG, Motion Picture Experts Group) to develop standards. “As part of our research into compression and image transmission algorithms, standardisation is a natural and important step in promoting our results, even though publication remains an essential means of making our work and progress known to the scientific community.” Nevertheless, given what is at stake economically, it is mainly industrial operators who submit solutions to standardisation bodies such as the ISO. Researchers generally work upstream, transferring their technology to an industrial operator who files patents and protects the solution. “We occasionally need to contribute alongside them. This is extremely time-consuming, but, nevertheless, strategic. This ensures direct contact with the technological challenges of the moment and, in the event of a successful outcome, it guarantees that our results have a marked impact within applications.” The standardisation process generally lasts a number of years, during which the algorithm is improved. This entails comprehensive testing. “For these aspects of software development, we benefit from three years funding for an engineer via a technology development action. This allows us to finalise our algorithms and to improve our chances, even though success may not always be forthcoming.”

Christine Guillemot, Inria Senior Research Scientist, Rennes - Bretagne Atlantique Research Centre

“Standardising is a way of promoting our experience”

Christine Guillemot is leader of the Temics project-team, which has become Sirocco. With four researchers, two engineers and 11 PhD students and post-doctoral researchers, she is working on 2D and 3D image and video sequence processing including, specifically, on aspects relating to the compression and communication of content.

standardisation assignments were undertaken in 2011, in particular with bodies including the IET F, ISO, W3C, ETSI and OGF.
ASSIGNMENTS
Research

In November 2011. “These joint research presentations, which are often packed with information, have therefore been beneficial to around a hundred researchers from all the research centres,” explains Pascal Guitton. “Forty or so subjects, grouped into seven topics, have been discussed.” These meetings will continue in 2012.

Supporting large-scale projects
To encourage synergy between teams and promote multidisciplinary research, the institute is supporting large-scale initiatives; these are four-year projects, which bring together several project-teams that complement each other to tackle a complex challenge. The aim is for this research to have a significant impact – including outside Inria – whether the result is finalised software, a tried and tested approach or a major theoretical breakthrough. In this way, the large-scale PAL (Personally Assisted Living) initiative is enabling nine project-teams (Grenoble, Sophia Antipolis, Nancy and Rennes) to jointly design and test personal home assistance technologies (for elderly, disabled or injured individuals).

“What makes the system original is the ability to combine the acquisition of data, indicating a fall, for example, with a response by autonomous robotic systems,” explains Stéphane Ubeda, “all at an affordable cost. We have fitted two apartments (in Nancy and Grenoble) with non-intrusive sensors and conducted initial automated experiments, as well as protocols, with around thirty patients.” Academics and industrial operators have also been able to share these experiences. To increase the impact of this research, the institute has decided to broadly strengthen its support for large-scale initiatives in 2012.

Promoting technological development
Software development forms part of the daily lives of every Inria team, within the framework of European or French National Research Agency (ANR) projects or, quite simply,
when illustrating or explaining a research task. Inria has created a dedicated organisation to ensure that all the teams are able to develop high quality code or put hardware platforms in place (such as the wheelchairs or hinged arms developed within PAL).

Engineers from the Experimentation and Development Departments (SED) within each Inria research centre – all scientists and the majority of them with a PhD – and the fifty or so young contracted engineers who assist them every year provide the researchers with support.

Within the framework of technology development actions (ADT), the engineers join research teams for at least two years. These ADTs, launched via internal calls for projects, are expanding with between 30 and 50 new ones every year.

Increasing fruitful collaborations

The Mobsim ADT, for example, is bringing together three engineers as part of the development of the NS3 radio network simulator which, promoted by Inria, is in the process of becoming the worldwide standard.

Within the framework of the excellence-in-equipment (Équipex) FIT (Future Internet of Things) project, which was launched in 2011, web-based communication by networks of several hundred physical measurement sensors installed on five sites (Grenoble, Lyon, Rennes, Lille and Paris) is tested, thanks to technologies developed by around a dozen engineers. This equipment is made available to all French researchers.

Finally, as part of the Sofa research platform, which brought together five project-teams to work on a realistic simulation of organs, in 2011, four engineers completed the development of a real-time medical simulation software suite (Mix-Surg), which will be used in the future university hospital institute (IHU) in Strasbourg.

This therefore means that development is able to break through barriers: “Engineers from Inria and the Fraunhofer...”

Anne Canteaut has been the Secret project-team leader since 2008. Within her team, with three permanent researchers and around ten PhD students and post-doctoral researchers, she takes an interest in the protection of information, in particular in the security of cryptographic algorithms. In 2012, she will chair the programme committee for the domain’s international conference: Fast Software Encryption (FSE) in Washington.

It’s a strange game that cryptography researchers play: on the one hand, they invent algorithms for authenticating confidential files, and on the other, they launch attacks on competing algorithms to expose their flaws. This is precisely how, in 2004, the dozen “hash” standards – key functions that create a sort of file fingerprint – were found to have flaws. The American NIST (National Institute of Standards and Technology) launched a competition to define a new and more robust standard by the end of 2012. “Having reached the semi-finals with our algorithm known as Shabal, we have been evaluating the security of the five finalists that are still in the running, since 2009. Seeking and examining new attacks also gives us new ideas for functions. For example, knowing that the high level of polynomials for hashing is one of the relevant security criteria, we developed a brand new mathematical tool for evaluating it correctly. This resulted in the Japanese Luffa algorithm being eliminated from the finalists.” It has become the basis for more general theoretical work. “In order to successfully quantify the security of hashing functions, we have developed new techniques, which precisely evaluate the quality of the algorithm’s construction and the impact of imperfections.”
Institute in Darmstadt (Germany) will take three to four years to create a fully interoperable generic environment for controlling virtual or augmented reality systems, which are applicable to all domains, with the focus on remote learning for surgical operations and remote industrial maintenance,” explains Stéphane Ubeda.

Creating experimental platforms
Dedicated to scientific experimentation for the evaluation of algorithms, for example, experimental platforms, generally developed with territorial partners, are managed by researchers and, mainly, by development engineers. They are open to scientists and companies in a wide variety of research and application fields.

“Num3sis in Sophia Antipolis is a modular architecture devoted to scientific computation and digital simulation,” explains Jean Roman. “It allows software to be rapidly integrated, complex simulations to be run and results to be viewed. Thanks to the work undertaken by the SED, it can potentially be adapted for all applications, including medical imaging and fluid dynamics.”

Jean Roman also refers to the PlaFRIM (Bordeaux), a federative high-performance computing platform for research in computer science and mathematics. Operational since May 2010, it allows algorithms and scientific computation codes to be tested before being deployed by large national computing centres.
The European Research Council recognises the visionary aspect of Inria

For the fourth year in succession, this European funding programme (the European Research Council, more widely known by its English acronym the ERC) is rewarding researchers with particularly ambitious and visionary ideas. The first ever prize winners from 2007, will submit their final results in 2012. “Inria has had winners every time, which is rare, both for young researchers (for which funding can be up to 1.5 million euros) and for experienced researchers (up to 2.5 million euros). The 23 winners within Inria project-teams – 18 for computer science research and 5 for applied mathematics – benefit from exceptional conditions,” says Jean-Pierre Banâtre, Director of European Partnerships. In concrete terms, thanks to these unusual financial resources, they create or strengthen their team and devote 75 to 80% of their time to their project, with a great deal of freedom. This is every researcher’s dream, which is why there is an increasing interest in the ERC, even though the selection process is rigorous (the success rate is 10 to 15%). There are now between 10 and 15 Inria candidates for each new call for projects. “Seven researchers from our teams won ERC awards in 2011: Xavier Rival, Rémi Gribonval, Erwan Faou and Andreas Enge in the young researchers’ category, and Marie-Paule Cani (INP Grenoble), Nicholas Ayache and Dale Miller in the experienced researchers category.” What is needed for this funding is to be individual. Selection takes account of the candidate’s potential and the excellence of his/her career as well as the quality of his/her project, the originality of his/her approach and the anticipated impact. The ERC has already awarded more than 2,200 grants across all disciplines. In the field of computer science, Inria is the European establishment which is home to the largest number of winners. The ERC’s ambitious and globally unique funding programme (7 billion euro over five years) will be repeated and even expanded for the period between 2013 and 2020. This funding has now become coveted and candidates from all around the world apply to conduct research in Europe.
Irill or free software as a research topic

The Initiative for Research and Innovation in Free Software (Irill) was launched in October 2010 by Inria, Pierre-et-Marie-Curie University and Paris-Diderot University. The research centre welcomes researchers who are interested in new problems posed by the development of free software, who are prepared to create tools to resolve them and to promote them with developers. This is a particularly innovative scheme in terms of both shape and substance.

“Nowadays, almost all software users make use of free software,” claims Roberto Di Cosmo, Director of Irill. This means that this movement, which began in the 1980s, has expanded. “We cannot support the idea that all software should be free, but this will become the rule for technical reasons: there needs to be access to all the source code in order to create and develop increasingly complex computer systems, which are subject to increasingly stringent quality requirements.”

Therefore, the monitoring, management and communication tools used by developers of free software need to evolve: the size of these “technical objects” is growing as the amount of software rises and the communities developing them expand. Irill’s primary mission is to become a globally unique centre of expertise, attracting researchers who are able to identify the issues of these growing code bases and to finalise solutions and tools permitting this collaborative development.

“These kinds of candidates are still fairly rare. In the world of computer science, researchers who publish articles and source code developers rarely speak to each other. Our aim is to connect these communities with each other and with industrial operators, in particular the SMEs who use free software.”
Julia Lawall is a quiet campaigner for free software. Nevertheless, her research has already helped radically change practices within the Linux community, with its free operating system developed in 1991 now being one of the most reliable and widely used. She became interested in free software somewhat by chance, in 2005, when studying the problems of switching from one version of Linux to another, with Gilles Muller, at the time at the École des Mines in Nantes (now at the Inria Paris – Rocquencourt Research Centre). They identified a key issue for which they developed a language that was able to identify conversions from millions of lines of Linux code, to specify them and even to search for errors, a unique generic tool. This was a fantastic gift for Linux, incorporated into the kernel of the system in 2010 and now used by the majority of developers. “Working in the field of free software, which is outstanding in terms of quality and functions, provides a fantastic opportunity to interact directly with the developers and to discover new issues for research. It also guarantees that our work will have a direct impact.”

Although Julia Lawall is a special case within the Linux community, having joined Irill in order to continue with her project, she is now surrounded by scientists engaged in similar research.

Free software disrupts the lines... of code
The efforts of Irill, which is home to around twenty people, are starting to bear fruit. Fifteen or so meetings were organised in 2011 to bring dozens of developers from different communities together (GNU, Debian, LibreOffice suite) for several days and to foster contacts.

“We don’t offer any permanent posts, but welcome researchers working for our partners. Our goal is to support projects that bring together researchers who share our view, to make them more visible and allow them to benefit from our dynamic approach for a few years. They will subsequently make room for other researchers and projects and remain in contact, building a large community.” At present, Irill is hosting three flagship research projects, all designed to improve the quality of code, programmed in OCaml language developed by Inria: the Coccinelle project, involving the development of Linux kernel code, headed by Julia Lawall, the Mancoosi project examining the quality of free software distribution, with, specifically, Stefano Zacchiroli, the leader of the Debian project and the Ocsigen project, investigating a new way of programming rich web applications.

Irill’s second mission is to help modernise education in order to prepare computer science students for these new forms of collaborative working, from both a technical and human point of view. The working environment can actually be confusing, with discussions between contributors occasionally being animated. “We began by getting computer science research-lecturers together to swap experiences and best practice. Ultimately, this could give rise to a shared model for courses, or even masters degrees specialising in free software.” Its third mission is technology transfer and development. “This is what will take the longest,” acknowledges Roberto Di Cosmo. For forty years, the software business has been based on the sale of licences, a model that is now reaching its limits, including for music and video. There is now a need to promote the adaptation of software, its qualification and certification, training and other related services – all emerging fields that require new skills.

Julia Lawall
Inria Senior Research Scientist, Paris - Rocquencourt Research Centre

“It provides the opportunity to interact closely with this community”

Following a degree in mathematics and computer sciences in Ohio (United States), a PhD thesis at the University of Indiana on programming languages, followed by post-doctoral research into the optimisation of programs at Inria’s Rennes – Bretagne Atlantique Research Centre, Julia Lawall has been a lecturer at the University of Copenhagen (Denmark) for eleven years working on the robustness of operating systems. She is now head of the Coccinelle project at Irill.
Research structuring plans within computational sciences are continuing to bear fruit. At the same time, the numerous calls for proposals for the Future Investments Programme, which punctuated the year 2011, have allowed for the consolidation of partnership and technology transfer policies, which are a priority for the institute.

“Partnerships, whether in France or around the world, are essential if we are to be at the forefront in our fields of research and known and recognised on the international stage,” says Antoine Petit, Deputy Managing Director of Inria. This view guides the institute’s partnership policy on all levels. That is why, this year, Inria signed a framework cooperation agreement with the French National Centre for Scientific Research (CNRS). “This agreement underlines the complementarity of our actions and our desire to work together” explains Antoine Petit. “It also documents our joint contribution to the establishment of site policies in the field of digital sciences, in close cooperation with universities and schools.” Thus, holding an annual site committee meeting will allow the two organisations, universities and schools to discuss their priorities and establish a genuine coordinated policy.

**Investments that consolidate Inria’s policy**

Within the framework of calls for proposals for the Future Investments Programmes (PIA), Inria has supported universities and schools by becoming involved in 17 selected laboratories of excellence (Labex) and three excellence initiatives (Idex). “This programme has also provided the opportunity for the institute to assert its presence within life and environmental sciences,” explains Antoine Petit. For example, the institute is involved in three of the six selected university hospital institutes, in a number of bioinformatics projects and two institute of excellence projects...
Tony Wen-Hann Sheu, from National Taiwan University, spent nine months at the Jacques-Louis-Lions laboratory in Paris in 2001. We had a mutual interest in the biomechanics of respiratory and circulatory systems and began a collaboration, which has since extended to the Taida Institute for Mathematical Sciences and the Taiwanese high-performance computing centre. We also devoted a great deal of energy to the dissemination of knowledge, by establishing student exchanges for summer schools and by regularly holding conferences. Our activities were supported both by France (Inria and Égide, the French Institute in Taiwan) and Taiwan (the National Science Council and representatives in France). For 2007-2008, we specifically benefited from a “Hubert-Curien partnership” (PHC) for the development of scientific exchanges, funded by the French Ministry of Foreign and European Affairs with the support of the French Ministry of Higher Education and Research. This dual aspect of research and dissemination earned us a Franco-Taiwanese award, each receiving 19,000 euros. This money allowed me to fund the summer school (Cermacs) at Luminy, and Tony Wen-Hann Sheu organised a similar seminar the following year in Taiwan. We are currently looking to establish a twinning programme between our two laboratories in order, in particular, to explore acupuncture remedies. We will be submitting an application as part of the cooperation agreement concluded between the National Science Council of Taiwan (NSC) and Inria, which will enable associate teams to be formed between the two countries.”

Marc Thiriet
French National Centre for Scientific Research (CNRS) researcher, Paris – Rocquencourt Research Centre

“Our action has two aspects: research and dissemination”

Marc Thiriet is a member of the Reo project-team. In 2011, together with his colleague Tony Wen-Hann Sheu, from the University of Taipei, he received the Franco-Taiwanese Scientific Foundation Award, created by the National Science Council of Taiwan (NSC) and the French Academy of Sciences. This prize was awarded for their work on physiological fluids, which they began together around ten years previously.
ASSIGNMENTS
Partnerships

Multi-resolution study of tropical instability waves in the Pacific Ocean, collaboration between the French National Centre for Scientific Research (LPO), Inria (Moise team) and the IRD (Legos, Locean).

... relating to carbon-free energies (IEED). “The PIA has also allowed us to reinforce our role as a national player in the field of technology transfer and innovation. Inria is therefore an active member of two of the eight projects approved by the technology research institute (IRT) and a partner in two other projects.”

The first fruits of the major European alliance
Created at the end of 2009, the European Knowledge and Innovation Community EIT ICT Labs (French involvement in which is coordinated by Inria) has witnessed research projects actually being established this year. “Inria is the 3rd largest contributor, participating in 47 activities, in terms of research, technology transfer and training, and the 2nd largest contributor in terms of budget, receiving 1.9 million euro in 2011,” underlines Olivier Festor, who succeeded Thierry Priol as the Senior Research Scientist for EIT ICT Labs in November. Inria teams are involved in two research action lines relating to the architecture of the Internet and cloud computing. They are also very much involved in ICT Labs thematic actions as well as in its technology transfer activities. “The action lines assemble interested partners around a given topic in order to identify avenues for research, prototyping or technology transfer, which are implemented under the aegis of activities,” explains Thierry Priol. These tools specifically allow shortcomings between research and technology transfer to be remedied by providing the means to progress further in terms of developing a technology. Consequently, for example, the Myriads project-team has been able to evaluate prototypes produced by the European XtreemOS and Contrail projects on cloud infrastructure software in order to facilitate technology transfers.

Increasing involvement in South America...
International news has heavily featured two major projects. The Ciric project (Communication and Information Research and Innovation Center) was selected at the end of 2011, in response to a

11 million euros of funding provided for ten years by the Chilean government, for the Ciric research and innovation centre project.

11 Inria teams involved in associate teams with Chile.

100 people attended the first Inria@Silicon Valley workshop.
call for proposals from the Chilean government for the establishment of an international centre of excellence for competitiveness, with the focus on technology transfer and start-up companies. The aim for Inria is to consolidate collaborations with Chile – 11 Inria teams are already involved in six associate teams – and to transfer the results of research. “The Chilean economy is extremely dynamic and is attracting foreign institutions,” underlines Hélène Kirchner, Director of International Relations. “For example, the Fraunhofer Institute (Germany) has set up a research centre there for biotechnologies and the Csiro (Australia) is establishing one for mining resources.” Headed by Claude Puech, the research centre is embarking on three crucial lines of research and technology transfer for the country: the internet and telecommunications, management of natural resources and hybrid energies. It draws on joint research projects between Inria and nine Chilean universities. At the same time, Inria has signed an agreement with the international Alma consortium, which operates the world’s largest network of radio telescopes (66 sub-millimetre antennae) in the Chilean Atacama desert. “These antennae will capture a vast quantity of data and Inria researchers will help to analyse and view this data and interact with it, in order to be able to interpret and process it.”

... as well as in North America

Inria has also extended its visibility in the North of the American continent this year by launching 11 new associate teams within the Inria @ Silicon Valley programme, established in 2010 by agreement with the Citris (Center for Information Technology Research in the Interest of Society) and designed to provide a structure for collaboration with the Universities of Berkeley and Stanford. “The workshop organised at Berkeley in May attracted around a hundred researchers, 77 of whom were American, and helped to create a genuine dynamic. We have already received six proposals for associate teams for 2012. In addition, our researchers, together with their American colleagues, are submitting projects to American funding agencies,” concludes Hélène Kirchner.
Mature technology transfer policy

The culmination of several years work, Inria’s technology transfer policy is now supported by mature tools and practices that are becoming more professional thanks to partners such as Oséo, CDC Entreprises and France Brevets.

“Inria’s technology transfer policy is designed for the long term. The institute’s doubling in size within a decade and changes in the research and innovation system have led us to structure our technology transfer activities. We have three mature tools which will support our activities from now on: our Institut Carnot certification, the Software Ambition programme and the creation, with CDC Entreprises, of a venture capital company, IT-Translation,” summarises Bruno Sportisse, Director of Technology Transfer and Innovation.

Institut Carnot certification recognises the primacy accorded by Inria to bilateral partnerships with industrial operators (ALU Bell Labs, Microsoft Research, EDF, etc.). It specifically allows the institute to support teams involved in these partnerships and to make its practices more professional. Another technology transfer option used by the institute consists of creating start-up. However, these start-up companies do not always have the financial resources needed to establish a commercial offering. “The creation of IT-Translation is the culmination of several years’ practical involvement in supporting business start-up resulting from public research in the field of software publishing, underlines Bruno Sportisse. This tool allows us to invest in a business when it is launched in order for it to be able to maintain a technological trajectory and create a product.”

Increased action for SMEs

Inria’s preferred technology transfer option involves innovative SMEs. “With the Software Ambition programme, our action for SMEs has taken on a new dimension: systems tried and
Marc Lavielle,
Inria Senior Research Scientist,
Saclay - Ile-de-France Research Centre

“Inria’s Development Department was key in the creation of Lixoft”

“I use statistical tools to create effective, reliable and fast software for modeling complex biological phenomena. In pharmacology, in particular, this approach allows what will become of a medication in the body and its therapeutic effect to be described. Our Monolix software is a modeling tool, which also allows virtual patients to be simulated in order to test various therapies quickly, reliably and at a lower cost. Thanks to this decision support tool, it is possible to limit failures and unnecessary therapeutic trials. Monolix’s very powerful algorithms allow far more complex models to be processed than is normally possible. Inria’s Development Departments immediately identified the software’s potential and helped me to build a consortium to continue its development with five major names from the pharmaceutical industry: Novartis, Roche, J&J, Sanofi and AstraZeneca. Once the tool had reached maturity, we established a technology transfer project, which was evaluated by the technology transfer action monitoring committee (Csatt), and finally created Lixoft in June 2011 for the development and marketing of Monolix (which is still free for academics). The most important aspect of this last stage was to find a leader for the project. The perfect person to take over management of the start-up, as he was interested and already had experience of establishing companies, was Jérôme Kalifa. For my part, I head up the company’s scientific committee and Inria is still associated with Lixoft by means of a research agreement that funds a position for an engineer. Popix is working on new statistical methods, which will be routinely implemented in Monolix. In this way, Lixoft and Popix are involved in the European Disease and Drug Modeling Project (DDMoRe), which is aiming to develop a software platform incorporating Monolix.”

Marc Lavielle is Head of the Popix exploratory action, a member of the laboratory of mathematics at Paris-Sud University and a member of the scientific committee of the Lixoft start-up (Oséo Award 2011).
ASSIGNMENTS
Technology transfer

tested over the course of previous years are reaching maturity and are now focussing on SMEs in the software sector. It is in fact these companies that are first in line to transform our technologies into products or services, i.e. into jobs,” explains Bruno Sportisse. In particular, this system takes account of the difficulty of transforming a prototype into a marketable product (cost, lead time, and risk for the company). “It is essential to control this risk in order to give the technology transfer the best chance of success,” adds David Monteau, Deputy Director of Technology Transfer and Innovation. “To do this, we are offering SMEs access to Inria’s expertise and a support process developed with Oséo, an organisation that is very familiar with SMEs, as its mission is to help them innovate.”

A thematic approach also allows more focussed support to be provided in sectors identified as growth areas for SMEs. For example, a support process has been put in place, in partnership with Oséo and Genci, to allow SMEs to access high-performance computing and thereby increase their productivity. “Thirty or so SMEs joined the programme this year, creating a project that could benefit from Oséo funding. Two other comparable initiatives are currently being launched on free software and software technologies for health,” explains David Monteau.

Technology transfer operations with long term support
Whether it involves the creation of a company or a consortium, a partnership or an I-Lab (a joint laboratory involving a team and an SME), technology transfer is a lengthy process. The technology must be taken to an appropriate stage, which assumes legal maturity (checking the compatibility of licences for software components) as well as technico-economic maturity (identifying potential applications, companies, etc.). Since 2009, all scientists leading projects have been assisted by the technology transfer action monitoring committee (Csatt). “This long-term support is a specific characteristic of Inria. It allows the
Erwan Mahé, Director of Development for Artefacto

“We hope to transfer the technology in 2012”

Artefacto focusses heavily on research and development. This Rennes-based start-up specialising in virtual and augmented reality, in particular in the field of urban planning, has 10 researchers among its 35 employees. “Inria has been our principal collaborative research partner since 2006, and many of our researchers are PhD students from ANR (French National Research Agency) or FUI (French interministerial fund) projects undertaken jointly. The I-Lab that we created in 2010 with Lagadic (ReV-TV) on the production of interactive television programmes, as well as a European project (Emospeech) with the Talaris team and the Acapela company on a voice recognition and speech synthesis platform and finally is conducting research with Wam on a prototype for augmented audio reality.” The SME thereby hopes to successfully complete its initial technology transfer to industry: a robust solution for on-screen visualisation of an urban development project in an existing environment, in other words, a combination of the real and virtual. It should be usable on small devices such as phones or tablets, in real time and on the move. “With the I-Lab, we have the resources to rapidly develop the technology, a crucial aspect of our extremely competitive business. We are working confidently by adapting our road map as research progresses, without any constraint other than success.” A researcher from each partner organisation worked on the project during the first year, while an engineer was subsequently recruited by Inria to develop the solution on a mobile platform. Artefacto is still running a project with Lagadic on the production of interactive television programmes, as well as a European project (Emospeech) with the Talaris team and the Acapela company on a voice recognition and speech synthesis platform and finally is conducting research with Wam on a prototype for augmented audio reality.

18
million euros is the total figure for IT2I funds underwritten by Inria-Participation and CDC Entreprises to invest in start-up resulting from public research into software.

100
representatives of SMEs attended the Inria-Industry forum on health care technologies, organised with Oséo, the Medicen, Cap Digital and Systematic clusters and the National Centre for Home Care and Independent Living.

8
I-Labs created since 2009.

Ever since it was established in 1998, the trained architect, Erwan Mahé, has been the Director of Development for Artefacto, which specialises in the design and production of 3D communication tools.
ASSIGNMENTS
Technology transfer

"Support for business aspects"

“I began working on a start-up project with Pierre Fillard two years ago. We began with a support system for planning and analysis of medical images but, following discussions with potential users, we realised that the market was not large enough to create a company. However, surgeons were really seeking technologies allowing them to view images in sterile conditions, in the operating theatre. Our project therefore changed markedly, which required genuine and complete commitment from the project owner! This approach was adopted in interaction with the technology transfer action monitoring committee (Csatt), the advantage of which is that it obliged us to formalise the business aspects and make use of opinions and advice to expand and reorientate the project. We also benefited from monitoring by the research centre’s Technology Transfer and Partnerships Officer, Patrice Prez, in order to regularly review and define the priorities and strategies (applications for funding, the opportunity to enter competitions, conducting trials, etc.).

This is the reason why we are currently compiling our entry for the Oséo creation development competition and why we are benefiting from two engineers funded by the Csatt, who have joined us on our adventure.”

Olivier Clatz
researcher within the Asclepios project-team, Sophia Antipolis - Méditerranée Research Centre

“Support for business aspects”

Olivier Clatz is an Inria research scientist, a member of the Asclepios project-team and coordinator of the CompuTumor associate team with the MIT in the United States. He is currently working on the development of a start-up project.

... risks to be reduced and horizons to be opened up, a crucial step when initiating technology transfer projects,” notes Patrice Prez, Technology Transfer and Partnerships Officer (CPPI) at the Inria research centre in Sophia Antipolis. Around 150 projects have benefited from this kind of support over the past three years. In practice, this is a lengthy process involving contact with the teams. “A large part of support consists of making a researcher adopt a different approach to analysis, in order to identify uses for software and the value it could add to the company. In other words, changing from a logic of invention to a logic of innovation,” explains Patrice Prez.

The experience accumulated by the institute as a result of supporting technology transfer projects should be of use to the brand new thematic development consortium, CVStene, a Future Investments Programme project led by Inria with its partners from the Allistène alliance, and thereby be of benefit to all public research. Another aspect of technology transfer, standardisation, is also expanding in France with the opening of the French national office of the World Wide Web Consortium (W3C) led by Inria, in September 2011. Specifically intended to promote open standards for the web with innovative SMEs and medium sized companies, it is particularly important to guarantee their satisfactory positioning on the market.

Making intellectual property management more professional

Inria has also made progress in the professionalisation of its intellectual property policy by concluding an agreement with France Brevets. “Our policy is pragmatic,” emphasises Bruno Sportisse. “We decide on the best way of implementing the transfer of a technology on a case by case basis. Support from France Brevets will help us in particular to combine our patent policy with standardisation and increase the international impact of our technologies.”
Digital technology is everywhere, in both our private and professional lives. Teaching computer science in high schools and colleges, in the same way as history or physics, is a civic duty. Inria is actively involved in this project and is helping to implement the computer and digital sciences option offered to pupils in their final year of science education at secondary school from autumn 2012.

“From the cradle to the grave, we are in permanent contact with digital objects. They are everywhere, from our living rooms, to our kitchens and our offices, etc. Digital technology has changed our lives, our way of working, consuming and communicating. Education must take note of this revolution,” asserts Gilles Dowek, Senior Research Scientist and Deputy Scientific Director at Inria. It is beyond doubt that although everybody, even those who are poorly educated, knows what DNA is or who Marie Curie is, no-one really knows how these digital objects that we use every day actually work.

Gérard Berry, member of the French Academy of Sciences and Chairman of Inria’s evaluation committee, has often said that “citizens have the choice of being ‘followers’, and therefore merely users, or co-creators, by ‘lifting the lid’ on this digital world to see what there is inside and making it their own.” Thierry Vieville, Senior Research Scientist and Scientific Mediation Manager for the Research Department, adds: “The aim, today, is to share sufficient knowledge and practices so that everyone is able to control digital objects and able to form an opinion on the social and economic issues surrounding digital technology.” There is therefore a need for computer and digital science to be widely taught to all pupils in secondary education in order to develop their scientific awareness, as is already the case with the teaching of physics and chemistry.

10,000 students should receive this education, in 2012-2013, which will be offered in more than 500 establishments.
ASSIGNMENTS
The spread of digital sciences

Maude Pupin, Lecturer at Lille 1 University

“We had to start from scratch”

When the Chief Education Officer in Lille asked computer science professors from the university to be involved in training computing and digital science (ISN) teachers, Maude Pupin immediately volunteered. “It is important that computer science is taught prior to higher education, that pupils are taught about digital technology,” she explains. Nine research-lecturers from Lille 1 University and four secondary school teachers, who were already teaching computer science at HND level, joined forces. They developed teaching materials and trained the 40 volunteer teachers, who would teach the computing and digital sciences option (ISN) in 33 of the 86 public high schools within the Lille educational district from autumn 2012. “Although they are all science teachers, their level of awareness of computer science is extremely disparate, we had to start from scratch,” relates Maude Pupin. The teachers received ten days training in algorithms and programming languages, the digital representation of information, architecture, systems and networks. Maude Pupin does have one regret: “There was only one woman among the 40 teachers trained.” Proof that there is still some way to go before computer science is widespread!

Maude Pupin is a computer science lecturer at Lille 1 University and a member of the Bonsai team (bioinformatics).

... of physics and chemistry, which is designed to prepare young people for life in an industrial era.

A key role in schools
For a number of years, Inria has been contributing to the dissemination of knowledge in the field of digital sciences (open days, the involvement of scientists in classes, the Science Festival) as well as to the creation of accessible scientific content and educational resources (Interstices web sites, Fuscia.info, Silo – Science informatique au lycée : oui ! (Yes to computer sciences in schools)). For specialist education in computing and digital sciences (ISN), which will be offered from autumn 2012 to pupils in their final year of science education at secondary school, Inria has helped to train teachers and produce manuals. This work is carried out with computer science research lecturers from universities and partners from various educational districts. Training has been offered to all maths, physics and chemistry, science and industrial technology teachers, as well as to life and earth sciences teachers, etc. The number of volunteers has broadly exceeded expectations.

A crucial area for facing the challenges of the future
At a rate of a few dozen teachers in the majority of educational districts, no fewer than a thousand teachers will have received more than 50 hours training and will be ready, by autumn 2012, to teach this new discipline, under the supervision of a new public inspector for this special area. Initially, almost 400 classes of final year science pupils, representing more than 10,000 students, will therefore receive two hours of class a week within the framework of specialist education and may be examined in this subject for their baccalaureate (equivalent to A-levels). The teacher’s manual has been available since autumn 2011 and the student’s manual will be available by autumn 2012. These manuals were devised and written by a group of research lecturers and teachers working
with Gilles Dowek and Thierry Vieville. “This is an experiment, it’s only the beginning,” emphasises Gilles Dowek, who has been working for five years on the implementation of this kind of education and remains optimistic about its enlargement to other final year secondary school classes and, above all, to years 11 and 12 (ages 15-16 and 16-17). Hopefully computer science will be taught from collège (middle school) before too long. The computing and digital sciences option (ISN) will also help to make IT professions more attractive. It is left to Gilles Dowek to conclude: “Young non-computer scientist engineers have attended a few dozen hours of computer science classes and they are ones who, in future, will build planes, engineering structures, cars, etc., all projects where computer science often represents more than 30% of the cost.”

The Inria Nancy – Grand Est Research Centre acts as a communication channel between the world of research and the public. “However, our core target, in terms of mediation, is secondary school students,” explains Véronique Poirel. Since 2007, the research centre has been increasing its initiatives: conferences in educational establishments, welcoming secondary school students for the “A day with a researcher” operation, support for projects such as MATH.en.JEANS, etc. In the autumn of 2009, the research centre supported three high schools trialling computer science education for a year 11 class (age 15-16). It has also been following another year 11 class (age 15-16), which has included digital sciences and techniques in a trial curriculum since 2010. It was therefore perfectly natural for it, along with the university and the Lorrain laboratory for computer science research and its applications (Loria), to support training for 38 teachers who will teach computing and digital sciences (ISN) from next autumn, and to welcome them in order to show them educational tools and entertaining and participatory workshops based on the concepts of algorithms, workshops that they could use with their students. “During the course of the day, they saw that numerous resources were available, that they would not be alone with their students!” she says.

Véronique Poirel has been the Head of Scientific Mediation and Scientific and Technical Awareness within Inria’s Nancy – Grand Est Research Centre since 2010.
ASSIGNMENTS
The spread of digital sciences

In order to successfully pursue its mission – producing knowledge and sharing it with the greatest number of people – Inria wanted to understand French people’s perceptions of digital technology.

In partnership with TF1 News, Metro and France Inter, Inria therefore commissioned a study by the market research institute TNS Sofres. Conducted over the course of summer 2011, this major survey consisted of one-to-one interviews with 1,200 French people aged 14 and above. It emerged from the 2011 survey that the French have difficulties finding their way around the digital universe, in understanding all the aspects and obtaining a comprehensive picture of it. Although they say that they are open to the new digital world, they lack information on the progress made and on the benefits for society.

Almost 9 out of 10 French people (87%) feel that digital technology has very positive consequences in terms of access to knowledge. However, 25% of French people think that cars will never be able to drive themselves and 27% believe that digital technology is not beneficial to the environment.

In light of this, Inria now wants to help with the construction of digital mapping and its dissemination to our fellow citizens. A web site for information and discussions on digital issues will therefore be launched in 2012. This open and participatory site will provide clear information that is accessible to everyone and will open up the floor to all those involved in the digital world.

To encourage public debate on social subjects related to digital technology, Inria also wanted to draw the attention of elected representatives and decision-makers to this view of public expectations in terms of digital technology. Inria wanted to establish a true observatory of the perceptions of digital technology. The results will therefore be updated every year.
COORDINATION

THE YEAR OF MODERNISATION
LIFE WITHIN THE EIGHT RESEARCH CENTRES
FOCUSING ON THE NEW IDENTITY

2011, at the heart of Inria
COORDINATION
The year of modernisation

In order for the scientific work of Inria’s teams to always be at the highest international level, all of the research support roles subscribe fully to the quest for performance and continuous improvement. The institute, which has doubled in size in ten years, is now perfectly organised for its current scale, in a rapidly changing research landscape.

CONTRIBUTORS
Luc d’Archimbaud,
Director of Administration, Finance and Assets in 2011

Éric Gautrin,
Director of Information Systems, Infrastructures and Computer Services

Muriel Sinanidès,
Director of Human Resources

The institute faced a number of major challenges during the course of 2011. First project: redefinition of the finance department’s activities following certification of the accounts for the year 2010. “recognition of the quality of our internal financial management processes”, says Luc d’Archimbaud with satisfaction. “Two of the six reservations issued by the auditors have already been lifted.” The exemplary collective approach that allowed procedures to be standardised was recognised by the 2011 Research Support Department Award.

Projects to deal with the challenges

“On this new basis, we began a radical transformation of all our financial support roles in order to guarantee greater efficiency and the best possible quality of service,” he continues. Ten or so working groups met over the course of the year to discuss management control, procurement, assignment expenses, contract management, etc. One of the outcomes of

The winners of the 2011 Research Support Department Award.
On the Grenoble site, we have initiated a specific ‘procurement’ policy on the basis of our own procurement mapping, with priority areas such as cleaning (a contract including a progress plan). The national modernisation of procedures has allowed us to identify everything that could be shared within the institute. The Procurement Manager in Grenoble took part in the national working group, which brought together buyers, public contract lawyers, general services and IT services. Within the research centre, she talked to all general site maintenance and management employees as well as research team and department assistants. She subsequently trained specifiers on the new procurement culture and is leading this local network by organising presentations for each new contract.

In general, this modernisation of practices has enabled us to define new internal rules that comply with regulations and suit our local organisation. In addition to changes in roles, procedures have been simplified – with the related administrative savings –, following the example of assignment expenses, which are now fixed, saving time for employees, research team and department assistants, the finance department and the accounts department.

A technical and human transition
A mobility plan, accompanied by a large-scale training plan, has allowed around thirty posts to be filled smoothly, the majority working remotely. A charter has been specially drafted to allow these new dispersed teams to work together effectively. The technical transition for user services should be completed in 2013. At the same time, a quality process has been initiated to professionalise the management of computer-related incidents, user requests and projects, based specifically on standards such as ITIL. A catalogue of services will soon allow the levels of service at different research centres to be standardised. The human resources team were often on the front line in driving these collective and individual changes. “We worked upstream with the departments
Inria—Annual Report 2011

COORDINATION
The year of modernisation

in question,” recalls Muriel Sinanidès. “The aim was for it to be possible to incorporate all HR related issues.” In particular, the work involved analysing the impact of these changes on expertise, activities and working organisations, supporting managers in driving through these changes and even assisting employees and developing their skills.

Support and guidance for everyone
Career support mechanisms were developed in 2011 with the creation of the “Head of Executive Management” post – entrusted with guiding department managers during their tenure – and the establishment of “researcher monitoring” – specific support for researchers in building their career plans. “At the same time, discussions were held on the issue of well-being at work, resulting in the definition of a framework of actions designed to cultivate the sense of a collective, improve working conditions and give everyone a place in the changes needed by the institute.”

In terms of diversity, Inria has committed itself to the subject of disability by setting out its policy and by defining an action plan focussing on integration, accessibility and disability awareness. “In all areas, these changes have been undertaken with constant attention to proper consultation with staff representatives,” underlines Muriel Sinanidès. “In 2011, we finally began important work on the question of our own operation.” This is a key issue in terms of modernising and optimising management activities. The increased efficiency will allow employees to be better supported during the key stages of their careers and changes in their roles to be better anticipated.

27
people from the Information Systems Department have changed jobs, the majority working remotely.

80
people within the Information Systems Department have benefited from training.

10%
The government has set a target for savings of 10% on procurement over the next three years.
COORDINATION
Life within the eight research centres

Each of Inria’s research centres covers all the institute’s roles and fields of research, with a few specific scientific and administrative aspects involving relationships with the local ecosystem. On the following pages, the eight heads of research centres present one of the institute’s projects as it is interpreted within their particular research centre.

BORDEAUX – SUD-OUEST
Pooling computing resources for research

“By sharing expertise and the resources of our research centre, the Bordeaux Institute of Mathematics (IMB) and the Bordeaux Laboratory of Computer Science Research (Labri), we have created an experimental supercomputing platform. Known as Plafrim, this infrastructure, with a national focus, has been operational since 2011. It is scalable and already pools more than 1,000 processing cores, the latest generation of processors, memory and architecture. These resources are placed at the disposal of researchers and industrial or institutional partners, in order to meet their requirements in terms of modeling and simulation, software development and testing, with the vital support of engineers from the institute’s Experimentation and Development Department. A wonderfully successful regional partnership.”

François Sillion,
Head of Research Centre

GRENOBLE – RHÔNE-ALPES
Promoting synergies within digital life sciences

“The institute chose Lyon, a city that is home to a large number of industrial operators and biological and medical researchers, to develop modelling and simulation activities for life sciences, one of the priorities of our strategic plan. Four teams are now carrying out research in this field in partnership with the University of Lyon’s laboratories, schools and the French National Centre for Scientific Research: Bamboo on bioinformatics, Numed and Dracula on biomathematics and Beagle on computational biology. Within the framework of the restructuring operation on the Lyon University Cité Campus, a computer science area will soon be created on the Doua site, bringing together the Inria teams and their scientific partners. We decided to take the lead in 2011 by setting up an Inria branch office devoted to life sciences, for the time being with the Beagle and Dracula teams. This proximity is already bearing fruit with, in particular, the creation of a joint scientific seminar. It also allows researchers to make better use of the rest of the Inria ecosystem.”

Isabelle Terrasse,
Head of Research Centre
Inria — Annual Report 2011

COORDINATION
Life within the eight research centres

LILLE – NORD EUROPE
Presenting research at the heart of the industrial ecosystem

“We opened a 200m² area within the EuraTechnologies cluster in Lille, devoted to digital technologies, in March 2009. This is the first showroom to be opened outside an Inria research centre. It allows us to be close to dozens of companies – major groups such as Capgemini and Microsoft, SMEs and innovative start-up – established within this former converted textile mill. We are involved in the leadership of the cluster. In our area, which is open to everyone, we stage a new demonstration every year (a fleet of collaborative robots demonstrated our expertise in trajectory planning in 2011). The activities of an Inria start-up are highlighted every quarter. Our researchers regularly present their activities to industrial operators on specific topics. This is an effective way of demonstrating the added value of research, finding new partners, encouraging researchers to transfer their work and undertaking scientific mediation. We welcomed 1,500 visitors last year, in particular from schools.”

David Simplot-Ryl,
Head of Research Centre

Karl Tombre,
Head of Research Centre

NANCY - GRAND EST
Trialling the new duties of research team assistants

“So every research team is supported by an assistant. The genuine right-hand man (or woman) of the team leader, he (or she) acts as an interface between researchers and the various research support departments; monitoring the budget, organising trips, recruitment, welcoming new arrivals, etc. Thanks to the modernisation of financial management tools and improvements in the institute’s human resources information system, assistants will be gradually relieved of some aspects of budget monitoring for teams. They will therefore be able to devote more time to monitoring collaborative projects (French National Research Agency, Europe) or the team’s technology transfer actions, thereby relieving researchers of a major part of their organisational and administrative duties. In 2011, we began successfully trialling this repositioning of their duties, with volunteer assistants and research teams. Assigning these duties to permanent staff also allows the institute to capitalise on these specific skills.”

Karl Tombre,
Head of Research Centre

Nozha Boujemaa,
Head of Research Centre

SACLAY - ÎLE-DE-FRANCE
Structuring the community of digital science researchers

“So an important step in the creation of an Ile-de-France campus for digital sciences is underway with the latest real estate operations. The PCRI, a building owned jointly with Paris-Sud University, was opened in November 2011 and houses one Inria team and six joint teams with the laboratory for computer science (LRI), a joint Paris-Sud University/French National Centre for Scientific Research research unit. The premises will bring together around 80 people from the institute (of a total of 250). As part of the Digiteo Labs operation, the institute owns a building constructed on the site of the École polytechnique’s campus in Palaiseau, which will house 250 people from mid-2012 (including 150 from Inria). In addition to the research centre’s management and departments, this building should house three of its own teams, the joint Inria/ Microsoft Research laboratory and the École polytechnique’s Computer Science Laboratory (LIX), a joint CNRS/École polytechnique research unit, with six of its teams being shared with Inria. Finally, around fifty researchers will be housed in the Digiteo building that the French National Centre for Scientific Research is building in Moulon.”

Nozha Boujemaa,
Head of Research Centre

Karl Tombre,
Head of Research Centre

54
“In May 2011, we opened a number of buildings on the Beaulieu campus, where we are based: a total of 8,500m², comprising a research centre reception, offices, a conference venue and a documentation centre. This ambitious project, launched in 2003, is the result of a joint effort that involved the financial and legal affairs departments, alongside the centre’s General and Technical and Administrative Departments. Inria, therefore, now has expertise in contract management at its disposal both for the management of works contracts and monitoring their outsourcing. The new buildings are accessible to disabled people, comply with HEQ environmental standards and are able to evolve in terms of connectivity. The conference venue has a 240-seat lecture theatre and an adaptable space that can welcome three groups of 70 people for workshops, tutorials, etc. This new independent infrastructure is also available to our academic and institutional partners. An Inria industry forum and the plenary meeting of the Quaero consortium have already been held here.”

“Getting students interested in digital sciences

“We have been supporting the Versailles educational district since 2004, for example, with the establishment of a trial computer science and digital objects option for year 11 pupils, in 2010. It is therefore perfectly natural that together with the Versailles educational district we have remained committed to introducing specialist education programmes in computing and digital sciences, which will begin in autumn 2012 on a national level. This option, an important step for the discipline of computer science, is supported by all the Inria research centres. More specifically, during the course of 2011, the Rocquencourt research centre welcomed interested students and around a hundred teachers for demonstrations and conferences. One researcher, François Fages, has become the educational district’s contact for monitoring the establishment of this teaching programme in high schools. He will be meeting teachers and students. At the same time, the research centre has continued to be involved in numerous activities for the general public and young people, including the Science Festival, the Mathematical Olympiad and the culture and mathematics show.”
COORDINATION

Focussing on the new identity

To develop the scientific excellence of its talented individuals, guarantee the international digital influence of France and play a leading role in the modernisation of society, Inria has redefined its identity. The three watchwords of this approach are legibility, visibility and attractiveness.

The new “Inria, inventors for the digital world” trademark, replaces man as the focus of the institute and underlines the notions of interaction and creativity that characterise digital science research.

What role should Inria’s new identity play? “We are evolving in a complex and demanding environment, which is radically and constantly changing,” explains Laurent Stencel, Communication Director, “and Inria’s aim is to work within the exclusive circle of authoritative research institutes in the field of digital sciences.” It was therefore important to examine the most effective and relevant way of making the institute’s research and innovation activities clear to the largest possible number of people. “Through this work, the institute can be more clearly identified as a world-class contributor on all issues relating to the place of digital technology in our society. We are also hoping that it will help to increase the opportunities for contact and meetings, speed up technology transfer to companies and innovation.”

Created with and for its teams

In order to rethink its identity, while taking account of everything that was at stake, Inria entered a collaborative reflection and creation process involving researchers and research support personnel who represent Inria with various audiences (foreign academics, industrial operators, researchers in other sciences, young people, journalists).

Inria’s fundamental principles took shape during the course of workshops, by synthesising the various contributions formulated within research centres. The words, the line and the symbols therefore translate into a few simple forms: a profession, the contour of a field of research, a role to be played in society, the aspiration of shared knowledge, etc.
RESEARCH AT THE HEART OF THE DEBATE
How do you assess the development of digital technology in terms of the potential risk to freedom?

**I. F.-P.**  
It must first be said that digital technology does have positive aspects in terms of freedom. You only need to look at the role played by social networks in the Arab revolution, the opportunity provided by the Internet to reveal your thoughts, discuss your ideas and demonstrate your talents, the greater ease of doing business offered by digital technologies, etc. Obviously, once digital technology becomes widespread so do the risks. I really believe that the fundamental issue is that of personal data. It is the raw material of digital technology, for both private exchanges and for companies. In sectors such as insurance and banking, analysis of this data is increasingly used to optimise choices and make everyday decisions. However, not all companies are aware of the systemic risks of digital technology, in particular the possibility of data it holds being hacked, and are lacking in sufficient protection. Yet, they should understand that this kind of incident could seriously tarnish their image, which would necessarily have economic consequences.

What can be done to ensure that effective protection is actually put in place by companies? And, how can we be sure that they are not misusing the data in their possession?

**I. F.-P.**  
I do not think that risk management can only be driven by sanctions and emergency measures. The awareness of companies must be raised upstream. They must be made to understand not only the need to comply with the law, but also the need for transparency and trust expressed by users and the commercial benefit they could draw from this. We will be aided in this respect by the overhaul of the European Directive of 1995, which will become a regulation, specifically imposing effective transparency.

In terms of collecting and using data, I believe that the principle should be that the means are proportionate to the purpose: to what extent is a certain piece of data needed to provide a certain service? This
ISABELLE FALQUE-PIERROTIN
1996
French Councillor of State, President of the Interministerial Commission on the Internet.
1997
Expert advisor to the OECD.
1997 to 1998
2001 to 2010
President of the Advisory Council and Executive Officer of the Internet Rights Forum.
Since September 2011
President of the National Committee for Data Protection (Cnil).
We are all stakeholders in regulation!

A preventive policy also requires a change by regulatory bodies. Therefore, we are striving to provide companies with concrete tools to help them understand and comply with the law: audits and the establishment of certifications, which may provide a competitive advantage for those who obtain them. We are also encouraging the National Committee for Data Protection’s correspondents within companies, which have been in existence since 2004, not to restrict themselves to a straightforward administrative role but to become a kind of “compliance officer” for the law.

What can be done if companies do not play the game?

I. F.-P. • In this case, the application of sanctions is inevitable. However, we will naturally start by talking. I am always astonished by the fatalistic attitude towards large digital companies, according to which there is nothing that can be done to force them to comply with the law. This is not true: we have the means to negotiate with them in order to ensure that they fulfil their obligations.

We are witnessing a very clear change in this respect: even in the United States, legislators and public opinion are ready to impose regulation on the digital sector, which was not the case a few years ago, because everyone is now affected by the use of personal data. International cooperation on this matter is also becoming established.

Nevertheless, surveys reveal the ambivalence of users as regards digital data. What do you think of this?

I. F.-P. • This is the famous “privacy paradox”: many people are concerned about the use that could be made of their personal data, but few of them take the trouble to protect the data on their computers, and even less on their smartphones. Twenty-five per cent of users have no lock code, while others never switch their phones off – should their phones be lost or stolen, all their data will be available to anyone! Here too, we need to educate users and make them understand that they are the leading players when it comes to their own protection, and that they also have a responsibility towards others. Young people, in particular, are not necessarily aware of the consequences of what they post on social networks.

What about the government? Do you think that there is still a fear among the population that personal data could be used by the state in a way that is prejudicial to freedom?

I. F.-P. • It is mentioned less than commercial use, but when there is the slightest incident, when there is a debate about the creation of a new public file, the cross-referencing of several files or the unwarranted use of a sensitive file, concern is re-awakened. It is true that, today, with all the digital footprints we leave behind, the very notion of anonymity has lost its meaning and that could be worrying. The state must therefore set an example, and the National Committee for Data Protection employs its powers of notification and control to verify this. This is a requirement for democracy, which is particularly sensitive in the face of the growing need for security.

Some people point to another potential risk: the use of data to “profile” users without their knowledge. This is a real risk. The use of personal data to guide corporate policy, which I mentioned earlier, should not lead to individual profiling. This would result, for example, in individuals being denied their basic rights, such as the right to be insured or to have a bank account, on the basis of subjective and opaque statistical criteria. In political and social spheres, this data – which is often public – should not be used to indulge in attempts to manipulate individuals. We must be vigilant in this respect.

We must demand greater transparency regarding the uses and guarantees of companies involved in the digital economy, and at the same time inform the general public about the rules to be followed in order to better protect themselves.
Innovation and digital technology. “Digital technologies have invited themselves into our lives and habits. Analysis of social networks, a search for new interfaces, etc. Recent scientific projects include how these tools are used. This is the point of “Usage labs” and “Living labs” developed in recent years, and partnerships with stakeholders such as the FING, etc.”

• Michel Cosnard, Chairman and CEO of Inria

How do you assess the impact of digital technologies on society?

D. K. ● The first important point is the consolidation of digital practices and their diversification. The idea of a virtual world that is separate from the real world does not reflect reality. Nowadays, digital technology is at the heart of social and economic mechanisms, organisations and lifestyles. It is changing the way we move, occupy space, organise our time, communicate, work, produce, distribute, consume, etc.

Second point: the development of digital technology has always formed part of the tension between order and disorder. We are proud of our French translation of the word computer as “ordinateur”; but it is not neutral: an “ordinateur”… creates order! This kind of computer science, which focusses on efficacy and order, is witnessing the addition of another kind that gives priority to innovation, changing social practices, interpenetration between the public and private spheres and, above all, communication between people, the main driver of digital development. As soon as a new space is opened to them, people take it over in order to continue, extend and diversify this communication, with one constant: it will never agree to “being restrained,” which is inevitably a factor of disorder.

Do you see this disorder as “useful”?

D. K. ● Yes, for a number of reasons. We have known for a long time that a large part of communication between people has no purpose other than communication itself. It may appear futile, but it is very important in oiling the wheels of society. It is the sign of a connection, of humanity. Of course, you can always create a hierarchy in the use of social networks, which would range from “lolcats” — those videos of cats that have no purpose other than to entertain — to the “Arab Spring.” Yet, everything is interrelated: the same people who have fun on these networks may subsequently use them for other purposes. You cannot have one without the other.

Another striking consequence of digital technology is a significant lowering of the barriers to innovation. It is possible, with a simple PC, to devise services, applications, tools or even products, with the opportunity to move
DANIEL KAPLAN

1986
Founder of JKLM, one of the world's leading electronic communication agencies.

1995
In charge of the “Internet, the stakes for France” report on behalf of the Acsel (Association de l'économie numérique).

Since 2000
Co-founder and Executive Officer of the Next Generation Internet Foundation (FING), a collective and open project, the aim of which is to “produce and share new and actionable ideas for anticipating digital transformations.”
How can you withstand being “exposed” by others without your consent?

D. K. • I believe more in agile responses than in hunting data in the hope of permanently removing it. I believe, for example, in obfuscation methods – drowning (for others) meaningful data beneath a flood of “noise”. As regards the “right to oblivion”, we are taking an interest in work based on the way in which the human memory is constantly rewriting the past, in order to create systems which, as time passes, would randomly obliterate certain records, while reallocating and blurring others. The statistical value would remain, but it would no longer be possible to definitively attribute a piece of data to an individual. All of this presents a considerable number of technical challenges, which are all open fields for computer science researchers!

What do you see as the other issues for research?

D. K. • Firstly, ecology. Here we return to the issue of order and disorder. Digital technology can admittedly permit a certain degree of streamlining, a reduction in losses/waste. This is necessary, but inadequate in terms of what is at stake, which requires radical changes. There is therefore a need to consider relocalisation, the life span of objects and, above all, sharing, a kind of growth that requires circuits, networks, etc. In short, a lot of digital technology is needed to make it work on a large scale.

Yet, there is always something that doesn’t work as it should! We need solutions that are ready to deal with the unexpected, which are as “generative” as possible and which the largest possible number of innovators will be able grasp. The main challenge for researchers is to be both within major programmes, which are essential, but also on other paths. It is a question of breaking down disciplinary barriers, combining knowledge, hijacking tools, daring to try things that may not work, but which will move society forward. I am convinced that this will result in vital breakthrough innovation.
We talk a lot about the “digital economy”, but what does it actually mean? Are there really two different economies, one digital and another which may not be?

**H. V.** I truly believe that digital technology has started a global economic and social transformation process, similar to the Renaissance or the Industrial Revolution. In the case of the latter, it is clear that the economy of coal and steel changed industry, but also led to the creation of large factories, the organisation of which was subsequently used as a model for schools, hospitals, the army, urban planning, etc. all calling for a certain level of capitalism. By exploring in greater detail, I believe that it is possible to distinguish between four categories of digital stakeholders: infrastructure suppliers (telecommunications, machines, etc.), which are already quite old, pure internet players, focussing on obtaining maximum, “over the top”, added value traditional activities (industries or services) which are obliged to push ahead with their digital revolution in order to avoid experiencing difficulties and, finally, an emerging hybrid sector that covers electronics, computing and services and which includes smart energy distribution networks (smart grids), robotics, communicating objects, etc. In my opinion, this is the most promising area in terms of job creation. Just think of everything that we will be able to do, thanks to home automation and robotics, to keep elderly people in their own homes for longer, for example.

**But why would this hybrid sector not be covered by traditional companies?**

**H. V.** I am not saying that they will not be present, but ultimately, theatres did not create the film industry and coachmen did not create the automotive industry, and major motor vehicle manufacturers will not necessarily have a monopoly on electric cars, because they remain deeply committed to “engine building”; when they really need to learn how to manage networks and flows. By purchasing batteries, SMEs employing 10 people will be able to produce cars, by focussing their creativity on a concept or design.

You could even go as far as to say that there are two digital economies. One that is technocentric using significant intellectual and capitalistic resources, and...
HENRI VERDIER
Since 2006
Founder member and President of the Cap Digital competitiveness cluster.
2007
Director responsible for innovation at Lagardère Active.
2009
Director of forward studies for the Institut Télécom responsible for creating the “Digital Future” think tank.
Since 2009
Member of the ARCEP foresight committee.
2010
Co-founder of the company MFG-Labs.
Inria — Annual Report 2011

LET RESEARCHERS
RESEARCH!

can be planned – which we need if only to guarantee the security of critical systems, and one that is based on the “commoditisation” of certain resources, on innovation and development of the user experience, where resourceful teenagers could change the story. At this point, we are entering a completely different world.

What are the characteristics of this “new economic world”?

H. V. • It is based on three factors. Firstly, the sharp drop in the cost of computing power: even the smallest PC has a recording studio with more capacity than that used by the Beatles, the latest smartphone is more powerful than the 1985 Cray II supercomputer, and they are all interconnected.

Secondly, the constant acceleration of progress: the previous generation could consider using technologies learned at school for their entire careers, which is obviously no longer the case. Finally, whatever may be said, the rise in the general level of education which, combined with the two other trends, gives considerable power to individuals outside organisations.

The combination of these factors has created a massive change, as young enthusiasts are able to play with a technology. In terms of innovation, this results in a “Darwinian model”: 100 attempts at success, but success that could change the world. It is no longer possible to anticipate breakthroughs: three Brazilian students in a garage are perhaps inventing something that will devastate your market, and you don’t know anything about it! All the more so given that this innovation is resulting more from a combination of technologies than from the development of new technologies.

What are the consequences for businesses? What strategies should they adopt?

H. V. • The main consequence is that there is more creative power outside organisations than inside. To use economic jargon, this is becoming the main “externality” and the most important thing for an organisation is therefore its ability to attract this creativity, in particular by creating platforms that capture this creation. Windows is a perfect example: thousands of people have developed software for Windows, which has given it value and allowed it to survive for thirty years! Another example is Amazon with its platform onto which hundreds of applications have been grafted. This is not the same thing as simply putting a catalogue on line. This is where we really are witnessing a new economy.

In your opinion, what is the role of research in this new economy?

H. V. • In Europe the predominant notion is that pure science leads to applied science, which results in innovation, which generates a product, which in turns leads to a market. Therefore, researchers must be obliged to think of applications and entrepreneurs obliged to carry out R&D. I, however, believe that innovation is not the logical continuation of R&D. It is a creative act that coincides with a market and creates a user experience, a “value in use”. This does not mean that research does not play a part in innovation. On the contrary, nothing would be achieved without it. All of the innovations in the digital field which have changed the world – Microsoft, Yahoo, Google, Facebook, Twitter, etc. – were created by people below the age of 20, who were not good researchers but who lived on a campus packed with technology. This is why I am a great believer in theoretical research. Researchers must be allowed to carry out research in every possible direction, as no-one is able to predict what they will need in two years time. There is also a need to create forums for exchange, like American campuses, in order for innovators to be able to “shop” for researchers’ work.

Innovation is not the logical result of R&D: while certain companies perish sitting on their patents, others start by guaranteeing themselves a market and then buying the patents they need to develop from others.
BALANCE SHEET
FACTS & FIGURES
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**Profit/loss**

**THEMATIC DISTRIBUTION OF PROJECT-TEAMS**
- **1** – 40 Algorithms, programming, software and architectures
- **2** – 33 Applied mathematics, computing and simulation
- **3** – 40 Perception, cognition & interaction
- **4** – 35 Networks, systems and services, distributed computing
- **5** – 31 ICST for life and environmental sciences

**SUMMARY OF PUBLICATIONS IN 2011**
- 62 books
- 1,608 journals and book chapters
- 2,762 conference proceedings
- 4,432 reference publications
- 518 reports
- 304 theses
- 46 accreditations

**CHANGES IN THE NUMBER OF REFERENCE PUBLICATIONS**
- 2001: 1,797
- 2006: 3,742
- 2011: 4,432

- **60%** of Inria's publications were filed in the HAL open archive (on line hyperarchive) in 2011.

- **37%** is the average success rate for French National Research Agency calls for projects.

- **42** standardisation assignments were undertaken in 2011, in particular with bodies including the IETF, ISO, W3C, ETSI and OGF.

- **71** patents awarded by 31st December 2011.

- **106** software submissions (APP).

- **23** initial patents filed.

- **255** patents in the portfolio.
In 2011, Inria was able to rely on 51,811,000 euros from research agreements and subsidies, including 15.02 million euros from European Research (FPRTD).

8 AWARDS WON BY INRIA TEAMS:

- The EADS annual award for science applications within aerospace
  Grégoire Allaire, Defi team
- EADS Foundation Grand Prize for computer sciences and their applications
  Georges Gonthier, Inria Microsoft-Research joint laboratory
- Gay-Lussac Humboldt Research Award
  Hubert Garavel, Vasy team
- Irène Joliot-Curie Award, businesswoman of the year
  Pascale Vicat-Blanc, Reso team
- Prix Blaise Pascal
  Rémi Gribonval, Metiss team
- Computer Science Research Award
  Xavier Leroy, Sandrine Blazy, Zaynarah Dargaye and Jean-Baptiste Tristan, Gallium team
- Prix Michel Monpetit - Inria
  Anne-Marie Kermarrec, Asap team
- Mathematics Research Award
  Olivier Saut, Angelo Iollo, Damiano Lombardi, Jean Palusseire, Didier Bresch, Thierry Colin, Emmanuel Grenier, Benjamin Ribba and François Cornéris, MC2 team

7 NEW SUCCESSFUL ERC APPLICANTS:

Starting Grants:
- Erwan Faou, Ipso team
- Rémi Gribonval, Metiss team
- Xavier Rival, Abstraction team
- Andreas Enge, Lfnt team

Advanced Grants:
- Dale Miller, Parsifal team
- Nicholas Ayache, Asclepios team
- Marie-Paule Cani, INPG Grenoble and Imagine team

HOSTING FOREIGN VISITING SCIENTISTS

TOTAL ANNUAL REVENUE FROM ROYALTIES FOR PATENTS AND SOFTWARE (in millions of euros)

66 associate teams with foreign research institutions and, in particular, 11 new teams associated with the Californian Universities of Berkeley and Stanford as part of the “Inria@SiliconValley” programme.

7 start-up created in 2011: Alien, Alphability, Ambientic, HiKoB, Lixoft, OCamlPro and Tocea.
BUDGET CHANGES

Inria’s original budget for the year 2011, which initially included a provision for resources and expenditure of €231.1 million, was adjusted to take account, on the one hand, of a reduction in state funding (cancellation of €0.297 million on adoption of the finance act by parliament) and, on the other hand, of a change in the level of allocation to reserves. It therefore amounted to €229.5 million (+ €9.4 million, i.e. + 4.3% compared to the original budget for 2010). The projected budget (including items carried forward from 2010) was raised to €265.2 million by the last amending decision.

As regards income, state funding only increased marginally, rising from €165.0 million in 2010 to €166.4 million (+ 0.9%). The subsidy for public service charges represented 70.7% of the organisation’s net income and covered 73.4% of its expenditure: €162.9 million was allocated as basic funding and €3.6 million for action 3 relating to funding for the ministerial post-doctoral programme.

Following a marked rise in 2010 (+ 45%), own resources also rose moderately in 2011 from €68.4 million to €69.1 million (+ 1.1%). Representing 29.3% of total funding in 2011, it originated as follows:
- €51.9 million from finalised research agreements and donations*,
- €2.9 million income from sales and services,
- €14.4 million from subsidies and miscellaneous income.

Excluding calculated income and expenditure, the financial accounts recorded the value of revenue collected as €235.6 million (compared to €233.4 million in 2010). The global level of income generation is 98.4% (compared to 101.1% in 2010), showing a loss of €3.7 million.

With an extraordinary deduction from working capital of €2.8 million and items carried forward from the previous year of €23.1 million, total resources were €261.5 million in 2011.

THE PURPOSE AND NATURE OF EXPENDITURE

By purpose, authorised expenditure (€226.8 million) related to:
- €127.0 million for scientific activities within research centres (aggregate 1), i.e. 56% of expenditure (compared to 51.4% in 2010),
- €27.5 million for joint research activities (aggregate 2), i.e. 12.1% of expenditure (compared to 17.3% in 2009),
- €72.3 million for support roles (aggregate 3), i.e. 31.9% of expenditure (compared to 31.2% in 2010).

By nature, this expenditure is broken down as follows:
- €155.2 million for personnel costs (68.4% of expenditure, compared to 66.2% in 2010), including €118.5 million for limited payroll and €36.7 million for unlimited payroll.

The number of “subsidised” personnel (i.e. those whose remuneration is based on state funding) reached 1,674.9 full-time equivalents (ETPT) in 2011, the cap associated with the initial budget being 1,676.9 full-time equivalents (for its part, the full-time equivalents cap determined by the finance act being 1,794 full-time equivalents). The number of “non-subsidised” personnel (those whose remuneration is based on the institute’s own resources) was 839 full-time equivalents.
- €54.3 million for ongoing operating and investment costs, i.e. 23.9% of expenditure (compared to 24.9% in 2010),
- €17.3 million for costs related to planned investment operations (OIP), i.e. 7.6% of expenditure (compared to 8.8% in 2010),

It should be noted that €3.3 million, paid in the form of advance payments to representatives for real estate operations,
Balance sheet
Facts & figures

were not included in payments. By including these payments, actual total expenditure rose to €26.6 million for OIPs and, globally, to €236.1 million (i.e. 90.3% of resources for the year).

CERTIFICATION OF THE ACCOUNTS

Since 2010 – and therefore for the second time in 2011 –, the institute’s annual accounts have been certified by a panel of auditors and include inventory accounting adjustments (unearned income, accrued income, prepaid expenses, accrued expenses).

The financial accounts for 2011 show operating results of +€4.5 million, a financial profit of +€0.2 million and an extraordinary profit of +€8.9 million. The accounting results for the period therefore display a profit of +€13.611 million.

The difference from the budget outcome (+€8.748 million) can be explained, on the one hand, by budget implementation operations not having a direct impact on the profit and loss account (budgetary income and budgetary expenditure entered in the balance sheet: +13.384 - 21.790 = -€8.406 million) and, on the other hand, by the inclusion of “calculated expenditure” (+€7.626 million: depreciation, provisions, etc.) and “calculated income” (-€4.083 million: reversals of previous provisions).

The net balance sheet (assets and liabilities) is €212.962 million (+5.2% compared to 2010).

The accounts for the period have been certified by the auditors. The number of reservations relating to this certification has fallen from six in 2010 to four in 2011**.

265.2 million euros is Inria’s budget for 2011.

70.7% of income comes from state funding.

+13.6 million euros is the accounting profit generated in 2011.

* Including €174 million for European agreements and €13.6 million for ANR agreements.

** The reservations lifted relate to monitoring paid leave and the valuation of provisions for flexitime accounts as well as to VAT-related control procedures. The reservations maintained – which all represent areas for improvement for internal control – relate to four processes: detailing accounts payable, monitoring fixed assets, monitoring suspense accounts, uniform application of the percentage-of-completion method to own resources.
## 2011 Budget

### Profit and loss account (€ million)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>variation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating income</strong></td>
<td>220.040</td>
<td>225.938</td>
<td>+ 2.7%</td>
</tr>
<tr>
<td>of which:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Net turnover</td>
<td>473.990</td>
<td>49.277</td>
<td>+ 2.9%</td>
</tr>
<tr>
<td>- (production sold)</td>
<td>(45.018)</td>
<td>(46.521)</td>
<td>(- 3.3%)</td>
</tr>
<tr>
<td>- (income from other activities)</td>
<td>(2.672)</td>
<td>(2.756)</td>
<td>(- 4.0%)</td>
</tr>
<tr>
<td>- Operating subsidies</td>
<td>170.547</td>
<td>171.017</td>
<td>+ 0.3%</td>
</tr>
<tr>
<td>- Reversals of provisions and transfers of expenditure</td>
<td>0.002</td>
<td>4.086</td>
<td>∞</td>
</tr>
<tr>
<td>- Other operating income</td>
<td>1.600</td>
<td>1.557</td>
<td>- 2.7%</td>
</tr>
<tr>
<td><strong>Operating result</strong></td>
<td>2.173</td>
<td>4.536</td>
<td>+ 109%</td>
</tr>
<tr>
<td><strong>Financial income</strong></td>
<td>0.065</td>
<td>0.179</td>
<td>+ 176%</td>
</tr>
<tr>
<td>of which:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Income from investments</td>
<td>0.003</td>
<td>0.145</td>
<td>∞</td>
</tr>
<tr>
<td>- Positive exchange differences</td>
<td>0.007</td>
<td>0.005</td>
<td>- 33.2%</td>
</tr>
<tr>
<td>- Income from the disposal of investments</td>
<td>0.052</td>
<td>0.000</td>
<td>- 100%</td>
</tr>
<tr>
<td>- Other financial income</td>
<td>0.003</td>
<td>0.030</td>
<td>+ 753%</td>
</tr>
<tr>
<td><strong>Financial expenses</strong></td>
<td>0.011</td>
<td>0.005</td>
<td>- 51.7%</td>
</tr>
<tr>
<td>of which:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Negative exchange differences</td>
<td>0.011</td>
<td>0.005</td>
<td>- 51.7%</td>
</tr>
<tr>
<td><strong>Financial profit/loss</strong></td>
<td>0.054</td>
<td>0.174</td>
<td>+ 222%</td>
</tr>
<tr>
<td><strong>Net operating profit/loss</strong></td>
<td>2.227</td>
<td>4.710</td>
<td>+ 111%</td>
</tr>
<tr>
<td><strong>Extraordinary income</strong></td>
<td>15.618</td>
<td>14.444</td>
<td>- 75%</td>
</tr>
<tr>
<td>of which:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Extraordinary operating income</td>
<td>0.327</td>
<td>0.075</td>
<td>- 772%</td>
</tr>
<tr>
<td>- Extraordinary income from equity operations</td>
<td>15.076</td>
<td>14.369</td>
<td>- 4.7%</td>
</tr>
<tr>
<td>- Reversals of provisions and transfers of expenditure</td>
<td>0.214</td>
<td>0.000</td>
<td>- 100%</td>
</tr>
<tr>
<td><strong>Extraordinary expenses</strong></td>
<td>6.660</td>
<td>5.543</td>
<td>- 16.8%</td>
</tr>
<tr>
<td>of which:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Extraordinary operating expenses</td>
<td>5.290</td>
<td>5.490</td>
<td>+ 3.8%</td>
</tr>
<tr>
<td>- Extraordinary expenses relating to equity operations</td>
<td>1.369</td>
<td>0.053</td>
<td>- 96%</td>
</tr>
<tr>
<td><strong>Extraordinary profit/loss</strong></td>
<td>8.958</td>
<td>8.901</td>
<td>- 0.6%</td>
</tr>
<tr>
<td><strong>Total income</strong></td>
<td>235.723</td>
<td>240.561</td>
<td>+ 2.1%</td>
</tr>
<tr>
<td><strong>Total expenditure</strong></td>
<td>224.537</td>
<td>226.950</td>
<td>+ 1.1%</td>
</tr>
<tr>
<td><strong>Profit or loss for the period</strong></td>
<td>+ 11.185</td>
<td>+ 13.611</td>
<td>+ 21.7%</td>
</tr>
</tbody>
</table>
OVERALL STAFF NUMBERS FOR RESEARCH CENTRES AND HEADQUARTERS
December 2011
•1 - 327 Bordeaux
•2 - 646 Grenoble
•3 - 312 Lille
•4 - 495 Nancy
•5 - 604 Paris - Rocquencourt
•6 - 678 Rennes
•7 - 458 Saclay
•8 - 567 Sophia Antipolis
•9 - 264 Headquarters

4,351
Inria’s global workforce.

1,153
new recruits.

610
end-of-studies interns welcomed.

TYPES OF ACTIVITY
(Scientific personnel 68% - Assistance and support staff 32%)
•1 - 1,415 researchers and research-lecturers
•2 - 258 post-doctoral researchers
•3 - 1,282 PhD students
•4 - 827 engineers, technicians and administrative staff
•5 - 546 engineers, technicians and administrative staff
•6 - 23 others

STAFF
December 2011
•1 - 1,658 staff funded by the state: 38.1%
•2 - 891 staff funded by the institute’s own resources: 20.4%
•3 - 83 research lecturers on deployment or with a chair: 2%
•4 - 1,719 staff neither paid nor funded by Inria: 39.5%

1,153
new recruits.

610
end-of-studies interns welcomed.
FOREIGN NATIONALITIES
December 2011
• 1 - 253 Europe (EU)
• 2 - 39 Europe (others)
• 3 - 38 Near East
• 4 - 33 Maghreb (excluding Tunisia)
• 5 - 49 Tunisia
• 6 - 35 Africa (excluding the Maghreb)
• 7 - 63 South America
• 8 - 19 Central America and Mexico
• 9 - 28 United States and Canada
• 10 - 7 Australia and New Zealand
• 11 - 43 China
• 12 - 10 South Korea, Japan and Taiwan
• 13 - 57 Indian sub-continent
• 14 - 24 South East Asia
  (mainly Vietnam)

77 foreign nationalities represented.

698 foreign staff paid by Inria.

INCUMBENT RESEARCHERS
BY AGE GROUP
December 2011
• Men
  43.6 years
  is the average age of incumbent Inria researchers.
• Women
  43.7 years
  is the average age of engineers and administrative technicians (ITA).

27 years
is the average age of PhD students.

PHD STUDENTS
(ALL FUNDING)
BY RESEARCH CENTRE
December 2011
• 1 - 107 Bordeaux
• 2 - 84 Lille
• 3 - 140 Nancy
• 4 - 207 Grenoble
• 5 - 240 Rennes
• 6 - 179 Paris-Rocquencourt
• 7 - 153 Saclay
• 8 - 172 Sophia Antipolis

1,282
PhD students in research teams, of which 22% are women.
Active project-teams in 2011

**Algorithmics, Programming, Software and Architecture**

**Algorithms, Certification, and Cryptography**
- **Lfant** (3, 23) Libre and fast algorithmic number theory. Bordeaux – Sud-Ouest. Andreas Enge.

**Architecture and Compiling**

**Programs, Verification and Proofs**
- **Ateam** (1) Analysis and Transformation based on reLiAble tool comPositionS. Lille – Nord Europe. Paul Klint.
- **Cassia** (3, 24, 25) Combination of approaches to the security of infinite states systems. Nancy – Grand Est. Michaël Rusinowitch.
- **Celtique** (3, 10, 43) Software certification with semantic analysis. Rennes – Bretagne Atlantique. Thomas Jensen.
- **Comete** (3, 13) Concurrency, Mobility and Transactions.

**Embedded and Real Time Systems**
- **S4** (3, 43) System synthesis and supervision, scenarios. Rennes – Bretagne Atlantique. Benoît Caillaud.
- **Trio** (3, 25) Real time and interoperability. Nicolas Navet.
- **Vertecs** Verification models and techniques applied to testing and control of reactive systems. Rennes – Bretagne Atlantique. Thierry Jéron.
Active project-teams in 2011

**APPLIED MATHEMATICS, COMPUTATION AND SIMULATION**

**Stochastic Methods and Models**

- **Aspi** (3, 34, 43) Applications of interacting particle systems to statistics. Rennes – Bretagne Atlantique. François Lévy-Véhel.

**Computational models and simulation**

- **Défi** (3, 13) Shape reconstruction and identification. Saclay – Île-de-France. Houssen Hadjar.
- **Ipso** (3, 10, 43) Invariant Preserving S0vers. Rennes – Bretagne Atlantique. Philippe Chartier.
- **Simpaf** (3, 33) Simulations and Modelling for Particles and Fluids. Lille – Nord Europe. Antoine Gloria.

**Optimisation, Learning and Statistical Methods**

- **Select** (3, 40) Model selection in statistical learning. Saclay – Île-de-France. Pascal Massart.
- **Tao** (3, 40) Machine Learning and Optimisation. Saclay – Île-de-France. Marc Schoenauer.

**PERCEPTION, COGNITION, INTERACTION**

**Interaction and Visualisation**

- **Aviz** Analysis and Visualisation. Jean-Daniel Fekete.
Knowledge and Data Representation and Management


Robotics


Networks and Telecommunications

Distributed Systems and Services
- Asap (3, 17, 43) As Scalable As Possible: foundations of large scale dynamic distributed systems. Rennes – Bretagne Atlantique. Anne-Marie Kermarrec.
- Oasis (3, 38) Active objects, semantics, Internet and security. Sophia Antipolis – Méditerranée. Eric Madelaine.
- Pops (3, 33) System and Networking for Portable Objects Proved to be Safe. Lille – Nord Europe. Nathalie Mitton.
- Rmod (3, 33) Analyses and Languages Constructs for Object-Oriented Application Evolution. Lille – Nord Europe. Stéphane Ducasse.
Computational Sciences for Biology, Medicine and the Environment

Computational Biology and Bioinformatics

- Bonsai (3, 33) Bioinformatics and Sequence Analysis. Lille – Nord Europe. Hélène Touzet.

Computational Medicine and Neurosciences

- Panietal Modelling brain structure, function and variability based on high-field MRI data. Saclay – Île-de-France. Bertrand Thirion.

Observation and Modelling for Environmental Sciences


Observation, Modelling, and Control for Life Sciences

- Biocore (14) Biological control of artificial ecosystems. Sophia Antipolis – Méditerranée. Jean-Luc Gouzé.
- Dracula (3, 21) Multi-scale modelling of cell dynamics: application to hematopoiesis.

- Virtual Plants (14, 2) Modelling plant morphogenesis at different scales, from genes to phenotype. Sophia Antipolis – Méditerranée. Christophe Godin.

* Teams were being created in 2011 and established on 1st January 2012.
## Inria’s academic partners

1. Centrum Wiskunde & Informatica  
2. Cirad  
3. CNRS (French National Centre for Scientific Research)  
4. École centrale  
5. École centrale in Lille  
6. École des mines in Nantes  
7. École des ponts ParisTech  
8. École nationale supérieure d’électronique, d’informatique et de radiocommunications de Bordeaux (The Higher National School for Electronics, Computer Science and Radiocommunications in Bordeaux)  
9. École nationale supérieure de techniques avancées (The Higher National School for Advanced Technologies)  
10. École normale supérieure in Cachan  
11. École normale supérieure in Lyon  
12. Ecole Normale Supérieure in Paris  
13. École polytechnique  
14. Inra  
15. Inserm  
16. Institut national de recherche en sciences et technologies pour l’environnement et l’agriculture (The National Science and Technology Research Institute for the Environment and Agriculture)  
17. Institut national des sciences appliquées de Rennes (The National Institute of Applied Sciences in Rennes)  
18. Institut polytechnique de Grenoble (Grenoble Polytechnic Institute)  
19. Supélec (Rennes)  
20. Charles-de-Gaulle University (Lille 3)  
21. Claude-Bernard University (Lyon 1)  
22. University of Bologna (Italy).  
23. University of Bordeaux  
24. University of Franche-Comté  
25. University of Lorraine  
26. University of Pau and Pays de l’Adour  
27. University of Provence  
28. University of Strasbourg  
29. Troyes University of Technology  
31. Denis-Diderot University (Paris 7)  
32. Languedoc University of Science and Technology (Montpellier 2)  
33. Lille University of Science and Technology (Lille 1)  
34. Haute Bretagne University (Rennes 2)  
35. Joseph-Fourier University (Grenoble 1)  
36. University of Montpellier 1  
37. University of Nantes  
38. University of Nice – Sophia Antipolis  
39. University of Paris-Est Marne-la-Vallée  
40. Paris-Sud University (Paris 11)  
41. Pierre-et-Marie-Curie University (Paris 6)  
42. Pierre-Mendes-France University (Grenoble 2)  
43. University of Rennes 1
Management Team

Michel Cosnard
Chairman and CEO
Antoine Petit
Deputy Managing Director
Hervé Mathieu
Executive Officer for Resources and Service Administration until March 2012
Paul Jolie
Executive Officer for Resources and Service Administration after March 2012
Claude Kirchner
Executive Officer for Research and Technology Transfer for Innovation
Chris Hankin
Chairman of the Scientific Evaluation Committee

Nozha Boujemaa
Inria Saclay – Ile-de-France Research Centre
Bertrand Braunschweig
Inria Rennes – Bretagne Atlantique Research Centre
Gérard Giraudon
Inria Sophia Antipolis – Méditerranée Research Centre
Isabelle Ryl
Inria Paris – Rocquencourt Research Centre
François Sillion
Inria Grenoble – Rhône-Alpes Research Centre
David Simplot-Ryl
Lille – Nord Europe Research Centre
Isabelle Terrasse
Inria Bordeaux – Sud-Ouest Research Centre

Karl Tombre
Inria Nancy – Grand Est Research Centre
Marie-Laure Inisan-Ehret
Accounting Officer
Laurent Stencel
Communication Department
Jean-Pierre Banâtre
European Partnerships Department
Pascal Guitton
Research Department
Hélène Kirchner
International Relations Department
Bruno Sportisse
Technology Transfer and Innovation Department

Stéphane Ubeda
Technological Development Department
Luc d’Archimbaud
Administration, Finance and Assets Department until February 2012
Laurent Azoulay
Administration, Finance and Assets Department after March 2012
Éric Gautrin
Information Systems, Infrastructures and Computer Services Department
Muriel Sinanidès
Human Resources Department
Renaud de Vernejoul
Head Office Administration

Éric Gautrin
Information Systems, Infrastructures and Computer Services Department
Muriel Sinanidès
Human Resources Department
Renaud de Vernejoul
Head Office Administration
Chairman
Michel Cosnard, Chairman and CEO of Inria

Ex-officio member
Alain Fuchs, Chairman and CEO of CNRS

Government Representatives
Marc Bellœil, person in charge of the “specialised bodies” department, DGRI (Research)
Grégory Cazalet, Head of department 3 (MIRES), Budget Department
Cécile Dubarry, Head of the Information and Communication Technologies Department, DGCIS (Telecommunications)
Éric Grégoire, Scientific Training Consultant, DGESIP (Higher Education)
Donatienne Hissard, Deputy Director of scientific exchanges and research (Foreign Affairs)
Christine Marteau, Manager of the Telecommunications Office, DGA (Defence)
Franck Tarrier, Head of the Software Department, DGCIS (Industry)

Appointed Members
Jean-Luc Beylat, Chairman of Alcatel-Lucent Bell Labs France
Bernard Jarry-Lacombe, National Secretary of the CFDT cadres executive trade union
Marie-Noëlle Jégo-Laveissière, Director of Research and Development, Orange Labs
Gilles Le Calvez, Director of Research and Development, Valeo Group
Jean-Yves Mérindol, Director of the Ecole Normale Supérieure in Cachan
Luc Paboeuf, Chairman of the Aquitaine CESR (Regional Economic and Social Council)
Laure Reinhart, Deputy Managing Director, Oséo and Oséo Innovation
Gérard Roucairol, President of the Ter@tec association

Elected Members
Representatives of scientific personnel, engineers and technicians
Lisette Calderan, Jocelyne Erhel, Laurent Pierron, Serge Steer

Advisory Capacity
Chris Hankin, Chairman of the Scientific Council
Antoine Petit, Deputy Managing Director of Inria
Malika Moha, Auditor General
Marie-Laure Inisan-Erhet, Inria Accounting Officer
Scientific Council

Chairman

- **Chris Hankin**, Professor of Computer Science (Imperial College), Director of the Institute for Security Science and Technology

Appointed Members

- **Yann Barbaux**, Vice Chairman, Executive Director of technology research centres (EADS)
- **Yolande Berbers**, Professor, Catholic University of Leuven (KUL)
- **François Bichet**, Chief Technology Strategist (Dassault Systèmes)
- **Jacques Blanc-Talon**, Head of the Scientific Domain “information engineering and robotics” (DGA)
- **Lucas Cardelli**, Principal Researcher (MSR Cambridge)
- **Yves Caseau**, Deputy Managing Director “Technologies, Services, Quality and Innovation” (Bouygues Telecom)
- **Claudine Medigue**, Head of the bioinformatic analysis laboratory for genomics and metabolism (LABGeM)
- **Chahab Nastar**, Vice-President, Business Intelligence Research (SAP)
- **Jean-Pierre Panziera**, Director of Engineering (Bull HPC)
- **Olivier Pironneau**, Professor of Numerical Analysis (Pierre-et-Marie-Curie University)

Elected Researchers

- **Yves Caseau**, Deputy Managing Director “Technologies, Services, Quality and Innovation” (Bouygues Telecom)
- **François Bichet**, Chief Technology Strategist (Dassault Systèmes)
- **Jacques Blanc-Talon**, Head of the Scientific Domain “information engineering and robotics” (DGA)
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- **Olivier Pironneau**, Professor of Numerical Analysis (Pierre-et-Marie-Curie University)

Evaluation Committee

Chairman

- **Gérard Berry**, Senior Research Scientist, Inria

Vice-Chairman

- **Hélène Barucq**, Senior Research Scientist, Inria

External Appointees

- **Didier Berthoumieux**, Alcatel Lucent
- **François Bourdoncle**, Exalead
- **Anne Doucet**, Paris 6 University
- **Jacques Droulez**, Collège de France, CNRS
- **Shéria Makram**, Philips
- **Éric Moulines**, Telecom ParisTech
- **Laurence Nigay**, Joseph-Fourier University
- **Xavier Vigouroux**, Bull HPC

Internal Appointees

- **Olivier Beaumont**
- **Stéphane Ducasse**
- **Alain Girault**
- **Jean-Frédéric Gerbeau**
- **Patrick Gros**
- **Sylvain Petitjean**
- **Marc Schoenauer**
- **Denis Talay**

Elected Researchers

- **Sylvie Boldo**
- **Liliana Cucu-Grosjean**
- **Julien Diaz**
- **Nicolas Holzschuch**
- **Gia-Toan Nguyen**
- **Marc Pouzet**
- **Antoine Rousseau**
- **Mathias Rousset**
- **Nicolas Sendrier**
- **Bruno Sericola**
- **Monique Teillaud-Devillers**
- **Emmanuel Thomé**

Elected Engineers and Technicians

- **Patricia Bournai**
- **Florian Dufour**
- **Edmonde Duteurtre**
- **Roger Pissard Gibollet**

- **Christine Leininger**
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