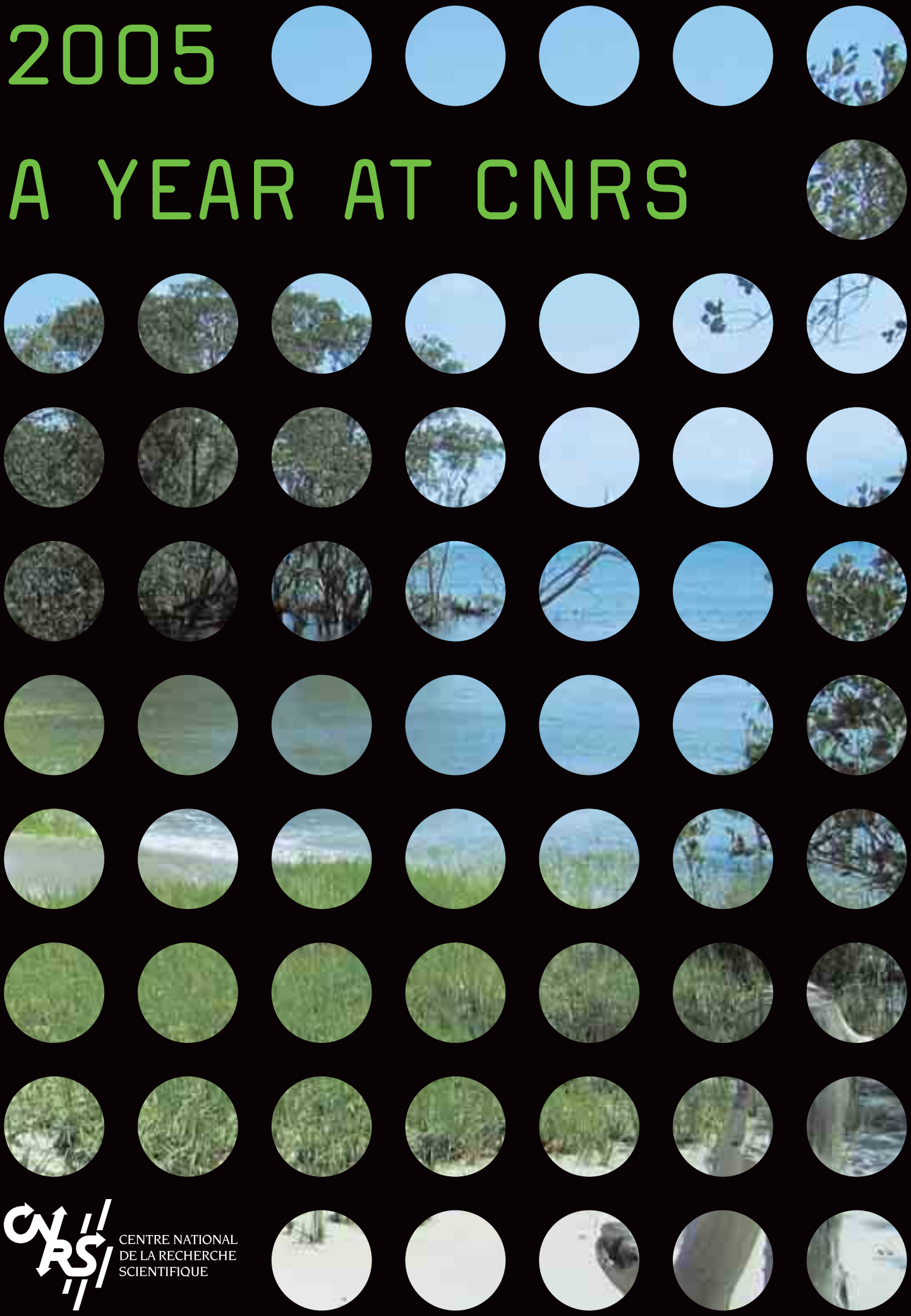
2005

A YEAR AT CNRS



CENTRE NATIONAL
DE LA RECHERCHE
SCIENTIFIQUE

CNRS IN BRIEF

THE **CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE** (NATIONAL CENTER FOR SCIENTIFIC RESEARCH) IS A GOVERNMENT-FUNDED RESEARCH ORGANIZATION UNDER THE ADMINISTRATIVE AUTHORITY OF FRANCE'S MINISTRY OF RESEARCH.

FACTS...

Founded in 1939 by governmental decree, CNRS has the following missions:

> To evalulate and carry out all research capable of advancing knowledge and ringing social, cultural, and economic benefits to society
> To contribute to the application and promotion of research results
> To develop scientific information
> To support research training
> To participate in the analysis of the national and international scientific climate and its potential for evolution in order to develop a national policy

CNRS research units are spread throughout France, and employ a large body of permanent researchers, engineers, technicians, and administrative staff. Laboratories are all on four-year contracts, renewable, with bi-annual evaluations. There are two types of labs:

> **CNRS labs:** fully funded and managed by CNRS
> **Joint labs:** partnered with universities, other research organizations, or industry

As the largest fundamental research organization in Europe, CNRS is involved in all scientific fields, organized in the following areas of research:

> Life sciences
> Physics
> Chemistry
> Mathematics
> Computer science
> Earth Sciences and Astronomy
> Humanity and social sciences
> Environmental Sciences and Sustainable Development
> Engineering

CNRS conducts some twenty interdisciplinary programs. One major objective is to promote inter-disciplinarity in order to improve knowledge, ensure economic and technological development or solve complex societal problems. They concern the following fields:

> Life and its social challenges
> Information, communication and knowledge
> Environment, energy and sustainable development
> Nanosciences, nanotechnologies, materials
> Astroparticles

The CNRS annual budget represents one-quarter of French public spending on civilian research. This funding comes from various sources:

> Government and public funding
> CNRS funds, primarily from industrial and EU research contracts and royalties on patents, licenses, and services provided

... AND FIGURES

Budget for 2006
€2,738 billion of which €494 million come from revenues generated by CNRS

Personnel
26,000 permanent employees
11,500 researchers and 14,500 engineers and technical staff

Organization

> 1,145 research and service units–almost 90% are joint laboratories
> €20 million devoted yearly to interdisciplinary research programs

Industrial Relations in 2005/2006

> 3,901 contracts signed with industry
> 35 framework agreements and 34 joint research units with industrial partners
> €132 million of revenues generated from contracts (EU contracts not included)
> 7,450 Patents in CNRS portfolio (238 deposited and 239 PCT)
> 578 Active licenses
> €50 million of royalties
> 220 start-ups created since 1999

DREI, AN OFFICE DEVOTED TO INTERNATIONAL RELATIONS

CNRS pursues an active international policy, whose implementation is the responsibility of the Office of European and International Relations (*Direction des relations Européennes et Internationales*, or DREI).
The DREI coordinates the international activities of CNRS with that of other research organizations in France and abroad. It oversees the role of CNRS in any international actions carried out by the French government, working closely to this end with the Ministries of Research and Foreign Affairs.
The DREI also plays a role in promoting international exchange. It proposes new venues for collaboration, based on a science and technology watch in other countries. This watch is carried out with the help of CNRS offices abroad and of scientific attaches in French embassies.
To accomplish its task, the DREI has offices in Paris responsible for four geographical areas (Europe; Americas; Africa and Middle East; Asia-Pacific) and 9 offices in foreign countries.

IN NUMBERS:
Exchange agreements: 80 (with 60 countries)
Foreign visiting scientists: 5,000 (PhD students, post-docs and visiting researchers)
Permanent foreign staff members:

> **1,340** researchers of whom 54% come from the European Union
> **262** engineers and technicians
> International Programs for Scientific Cooperation (PICS): **332**
> International Associated Laboratories (LEA + LIA): **54**
> International Research Groups (GDRE + GDRI): **56**
> International Joint Units (UMI): **9**

BUDGET FOR 2006: €10M

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www.drei.cnrs.fr

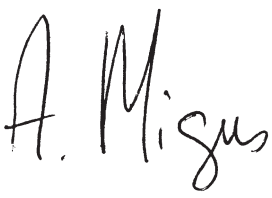
CNRS is a leader in the European Research Area thanks to the competencies of our 11,700 research scientists and 14,400 engineers, technical and administrative personnel. This document provides an overview of the 1,200 units involved in our organization; most of which work in partnership with institutes of higher learning and research as well as other research organizations. All the scientific advances and discoveries presented here were described in the 2005 press releases from our various departments. You can view them online at the CNRS web site (http://www.cnrs.fr).

CNRS plays a central role in increasing knowledge. Our researchers study a wide range of phenomena, from the challenges facing society concerning health, the environment, climate change and energy renewal, to the development of intelligent systems or new materials and research in the human and social sciences.

2005, which was an eventful year for science, was also marked by two important institutional items concerning our organization:

> CNRS was one of the top ten patent submitters in France, making it a key player both in the country's industrial policy and in its economic development;
> CNRS is the top European organization in terms of funding received from the sixth framework program for technological research and development (FP6) launched by the European Union. More than 665 research contracts were signed, of which 216 are coordinated by CNRS (European networks of excellence, integrated programs...). These contracts fulfill the thematic research priorities of the EU, and support and encourage research teams in their work.

For CNRS, whose reputation has been built over the decades through the quality of our research, this recognition is an encouragement to pursue that course while making sure that we both nurture society's economic and industrial fabric with our advances, and address the key challenges facing society. On behalf of our organization, I invite you to look back on a few of the major scientific milestones achieved in 2005.



ARNOLD MIGUS /
CNRS DIRECTOR GENERAL

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KEY FIGURES...

CNRS PUBLICATIONS

CNRS participated in over half (51%) of French scientific publications in 2003* concerning materials and life sciences. CNRS publications represent two-thirds (66%) of French papers in our fields of study (i.e. outside of medical research).
The contribution of CNRS laboratories to French scientific production is particularly significant: over 75% in Physics, Earth sciences and Astronomy, and Chemistry.
Nearly half (49%) of CNRS laboratory publications are written in collaboration with laboratories outside France.
Two-thirds (67%) of CNRS international joint publications are published with at least one country in the European Research Area and one quarter (25%) with the United States.

*Given the amount of time required both to record publications in the *Science Citation Index* database (SCI, Thomson-ISI) and to identify the publications of CNRS laboratories in the database, the most recent data available is for 2003.

CNRS HAS **26,100 PERMANENT EMPLOYEES, INCLUDING 11,700 RESEARCH SCIENTISTS AND 14,400 ENGINEERS AND TECHNICAL AND ADMINISTRATIVE STAFF.**

OVER 5,500 **NON-PERMANENT EMPLOYEES** (PHD STUDENTS, POST-DOCTORAL STUDENTS, ASSOCIATE RESEARCH SCIENTISTS, THOSE WORKING WITH LIMITED TERM CONTRACTS, ASSISTANTS, TEMPORARY WORKERS, RESEARCH FELLOWS, APPRENTICES, ETC.) ARE ALSO ON CNRS' PAYROLL.

RESSOURCES: **€2,437 BILLION EX-VAT, INCLUDING €2,047 BILLION** FROM GOVERNMENT SUBSIDIES, **€273 MILLION** FROM PUBLIC, INDUSTRIAL, OR EUROPEAN PARTNERSHIPS, AND **€53 MILLION** FROM PATENT ROYALTIES AND LICENSING FEES.

CNRS IS AMONG THE TOP **10 PATENT SUBMITTERS IN FRANCE.**

RESEARCH WITHOUT BORDERS

> 85 **SCIENTIFIC COOPERATIVE AGREEMENTS WITH 60 COUNTRIES**
> 5 000 **FOREIGN RESEARCH SCIENTISTS** ARE HOSTED EACH YEAR IN THE CNRS-ASSOCIATED LABORATORIES
> 268 **INTERNATIONAL SCIENTIFIC COOPERATION PROGRAMS**
> 58 **ASSOCIATED INTERNATIONAL LABORATORIES**
> 55 **INTERNATIONAL RESEARCH NETWORKS**
> 15 **INTERNATIONAL JOINT UNITS**
> 1,340 **FOREIGN RESEARCH SCIENTISTS** (INCLUDING 54% FROM THE EUROPEAN UNION) ARE CNRS PERMANENT RESEARCH SCIENTISTS
> 9 **OFFICES ABROAD** (IN BEIJING, BONN, BRUSSELS, HANOI, JOHANNESBURG, MOSCOW, SANTIAGO (CHILE), TOKYO, AND WASHINGTON)

INDUSTRIAL RELATIONS

> **€53 MILLION EX-VAT IN PATENT ROYALTIES AND LICENSING FEES** IN 2005
> NEARLY 4,000 **ONGOING INDUSTRIAL AGREEMENTS**
> 37 **FRAMEWORK AGREEMENTS** WITH MAJOR GROUPS, INCLUDING 5 FINALIZED IN 2005 WITH BAYER CROPSCIENCE, ALCATEL, EADS, AIRBUS AND FRANCE TELECOM
> 65 **JOINT RESEARCH STRUCTURES WITH INDUSTRY,** INCLUDING 18 **JOINT LABORATORIES**
> NEARLY 220 **INNOVATIVE COMPANIES** SET UP OR BACKED BY CNRS-ASSOCIATED LABORATORIES HAVE BEEN FOUNDED UNDER THE JULY 1999 FRENCH LAW ON INNOVATION AND RESEARCH. THOSE FIRMS CREATED NEARLY 2,000 **JOBS BETWEEN 1999 AND 2005.**
> **AVERAGE TIME REQUIRED TO PROCESS INVENTION REPORTS : 35 DAYS** (THE SAME AS THE BEST AMERICAN PATENT OFFICES)

CNRS: DECIDEDLY **GLOBAL**

The international dimension of research is a daily reality at CNRS. Nearly half of the publications by CNRS research scientists are joint efforts with partners outside France. Optimizing and better organizing exchanges and collaboration between scientists is one of CNRS' major objectives. We encourage our laboratories to work with the finest teams abroad and to become more competitive on the world stage. In that sense, 2005 was a year of strong growth in both structural initiatives and interdisciplinary international cooperation.

As for opening to international cooperation, CNRS' priority is full integration within European research. Extensive efforts have been made to develop partnerships with similar European organizations such as Max-Planck-Gesellschaft. The creation of a European Research Area is another key CNRS goal -- we intend to add a European dimension to our recruitment and mobility strategy.

CNRS played an active role in the sixth framework program. CNRS leads Europe with 277 teams receiving financing from this program for thematic priorities. At the end of

CNRS is actively developing partnerships with the Max Planck Society.

>
CNRS-IMPA: A FRANCO-BRAZILIAN INTERNATIONAL JOINT UNIT

CNRS and Impa (Instituto Nacional de Matemática Pura e Aplicada) have created an International Joint Unit (UMI) located in Rio de Janeiro. Research covers algebra, mathematical analysis, mathematical economics, and fluid dynamics.

>
CNRS ADOPTS THE EUROPEAN CHARTER FOR RESEARCHERS

In Brussels on December 16, 2005, the CNRS signed a statement whereby CNRS adhered to the European Charter for Researchers and to the Code of Conduct for the Recruitment of Researchers. The Charter defines both the rights and obligations of researchers and their employers. The Code of Conduct is intended to improve recruiting conditions for research scientists.

2005 we were well ahead of our partners both in France (CEA 112, Inserm 94) and Europe (Fraunhofer 239, Max Planck 133, CSIC 110). CNRS is the European organization receiving the most funding from the European Commission, around 200 million in 2005.
But international actions by CNRS go well beyond the European Union. We have already asserted our top priority: expanding scientific cooperation with Asia, in particular with countries that are becoming major players in international research: China, Japan, and India.

Workshop on franco-japanese research, December 1st and 2nd, Paris.

CNRS AGREEMENTS IN 2005

In 2005, CNRS signed several partnership agreements including:

— **CNRS-DOE Agreement**
The General Agreement signed in Washington between CNRS and the Department of Energy (DOE) reinforces Franco-American cooperation in the fields of fundamental scientific research and research on development. Two specific agreements concern the fields of low- and medium-energy nuclear physics, the physics of relativistic heavy ions, particle physics, astrophysics, and cosmology.

— **CNRS-CERN Agreement**
CERN (the European Laboratory for Particle Physics) and CNRS signed a framework agreement to facilitate the exchange of research scientists between both institutions.

— **Republic of Serbia**
initial framework agreement for scientific cooperation between CNRS and the Ministry of Science and Protection of the Environment of the Republic of Serbia.

— **Singapore**
CNRS and Nanyang University signed an agreement to develop both joint research projects and structured initiatives.

— **South Korea**
CNRS signed three cooperative agreements: one with the Korea Institute of Science and Technology (KIST); a second with the Korea Research Institute of Bioscience and Biotechnology (KRIBB); and the third with the Institut Pasteur Korea.

CNRS PARTNERSHIPS IN 2005

In 2005, CNRS created five International Associated Laboratories (LIA) and seven International Research Networks (GDRI), including:

— **'Joint Underground Laboratory in Europe'** (JOULE)
Created by IN2P3-CNRS, CEA, and JINR, the Franco-Swiss LIA is dedicated to research on the properties of neutrinos, dark matter, and super heavy elements.

— **'Comparison of Democracies in Europe'** (CODE)
This Franco-German LIA will carry out comparative research on democratic systems in Europe in the context of the expansion of the European Union.

— **'Environmental geochemistry'**
An LIA created to strengthen Franco-Russian collaboration on the study of the interaction mechanisms between minerals/solutions/living organisms, in order to address concerns about global warming and the impact of human activity on the continental biosphere.

— **'Nano- and microsystems'** (NAMIS)
This GDRI brings together French, Japanese, South Korean, Swiss, German, and Finnish teams.

— **'Modern architectures in the Mediterranean: Sources, Identification, Trends'**
France, Algeria, Egypt, Spain, Greece, Italy, Morocco, and Tunisia are involved in this network.

— **'European Ultra Relativistic Energies Agreement'** (EUREA)
The purpose of this network, which includes French, Russian, Polish, and Ukrainian laboratories, is to perform data analysis of the Star and Phenix experiments with the RHIC collider in the United States, and to prepare for the Alice experiment in CERN's LHC.

>
WORKSHOP ON FRANCO-JAPANESE RESEARCH

CNRS, several French university and research organizations, and Japanese partners organized the 'Workshop on Franco-Japanese Research' in December. This event both demonstrated the strategic importance of cooperation for the two countries and identified priority areas of collaboration.

TECHNOLOGICAL TRANSFER: CNRS' ADDED VALUE

Since 2003, CNRS has intensified efforts to increase the transfer of competencies and technological advances developed in its laboratories to the business world. This effort was particularly visible in 2005 as CNRS initiated promising and ambitious actions and major programs.

Now a full range of clear, well-defined processes will be implemented, from the moment an innovation is first identified to when the best strategy is chosen to optimize its value, so that all of society may benefit.
CNRS has begun to rationalize its patent portfolio in order to limit maintenance costs and

> FRAMEWORK AGREEMENTS: THE 2005 HARVEST

Five framework agreements with major industrial groups were finalized this year. Some of them give concrete expression to longstanding collaborative projects: Bayer Cropscience, Alcatel, EADS, France-Telecom, Airbus. Today there are around 4,000 ongoing industrial contracts, 37 framework agreements with major groups, and 65 joint research organizations with industry (including 18 joint laboratories). CNRS wants to develop still more strategic relationships with major corporations in order to better meet development requirements.

> CNRS AMONG THE LEADERS FOR PATENT SUBMISSIONS IN FRANCE

In 2005, CNRS is among the top-ten French submitters of patents. The growing number of patents and their increasingly professional management has paralleled a regular increase in CNRS in-house resources: the amount of royalties received by CNRS for licenses granted exceeded € 50 million (before sales tax) in 2005.

> A NEW SHOWCASE FOR CNRS TECHNOLOGIES

In 2005, two tools were developed to present technologies offered by CNRS. They are intended for businesses, to offer services for partnerships, and for technological transfer. The first tool, the Competency Directory, increases the visibility of our research teams' know-how and their areas of expertise. The Directory lists 80% of CNRS units, making them easily accessible to non-specialists.
The second tool, which presents CNRS' intellectual property rights, automatically classifies our patents according to their possible applications in various industries and economic sectors. It simplifies access to CNRS intellectual property rights by linking innovations to major technico-economic areas. This will make it much simpler for SMEs to access the CNRS patent portfolio. Both tools will be fully operational in 2006.

especially to organize the portfolio into major technico-economic domains. This classification greatly facilitates industrial firms' access to the innovations of public research.
Long-term business partnerships are among the key factors for leveraging research results. During 2005, CNRS signed new agreements with major industrial firms. We worked intensely for Small to Midsized Enterprises (SMEs), relying on local measures targeting key industries, so SMEs may also benefit from CNRS research and partnerships. Furthermore, CNRS has maintained its commitment to the innovative companies stemming from our laboratories.
Here are a few of the important events that marked 2005 in technological transfer.

>
ISO 9001 CERTIFICATION FOR FIST SA

Fist SA, a CNRS subsidiary, received ISO 9001 certification from the Veritas Bureau in 2005 for its technology transfer and brokerage activities. Fist SA became the first French Technology Licensing Office (TLO) to obtain ISO 9001 certification.

CNRS works with partners to transfer basic research to its applications.

>
INNOVATIVE COMPANIES

In 2005 CNRS assisted in the creation of a dozen innovative companies. Nearly 220 innovative firms created through or backed by CNRS laboratories since the French July 1999 Law on Innovation and Research are still in business. This has resulted in over 2,000 jobs between 1999 and 2005. Five companies created or being created by CNRS laboratories were named 'Prize-Winning Projects' in the 2005 National Competition for the Creation of Innovative Companies (two in the 'Emerging' category and three in the 'Creation/Development' category).

>
A THREEFOLD INCREASE IN THE SPEED OF PROCESSING INVENTION REPORTS

The average processing time for invention reports dropped from over 100 days in 2002 to just 35 days in 2005. These figures place CNRS at the same level as the best patent offices in American universities. Furthermore, 375 invention reports were handled by the Commitments Committee in 2005. Among them, 110 were supported by CNRS and resulted in patent applications.

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A YEAR OF SCIENTIFIC CULTURE…

>

During the Science Fair held October 10-16, 2005, CNRS organized over 560 events throughout France: exhibitions, open house days for laboratories, films, debates, science bars, etc.

1 — **At the CNRS booth** presenting research in Guiana at the *Cité des sciences de la Villette* in Paris, visitors discovered the surprising diversity of fauna in the Amazon basin.

2 — **At the Science Village** set up in the Luxembourg Gardens in Paris, visitors both young and old explored matter and learned about the mysteries of symmetry.

>

2005, the World Year of Physics (WYP): CNRS paid tribute to this field by participating in no less than 220 of the 360 projects officially recognized by the WYP organizing committee. In all, some 600 CNRS events were held across France to help the general public discover and appreciate physics. A few examples:

3 — **Making rainbows** in Paris' Tuileries Gardens.

4 — **In December in Paris,** a 'tornado machine' raised the public's awareness of movement in fluids.

5 — **Two thousand five hundred people** discovered the bizarre world of quantum physics by attending the Quantiquanta debate and show in the Midi-Pyrénées region, produced by the *'Les chemins buissonniers'* CNRS Science Club.

>

Over 500 youngsters from a wide variety of backgrounds and 200 research scientists from numerous fields participated in the 15th edition of the Science and Citizens Conference held at the Futuroscope in Poitiers October 21-23, 2005.

6 — **Topics included** 'The EU and Citizenship', 'Knowledge for building the future', 'Are human beings part of nature?', 'Do natural, mathematical, and symbolic forms rule the world?', *etc.*

>

As happens each year, CNRS organized a scientific field trip for young patients of the Robert Debré Hospital in Paris. In 2005, twenty children were able to discover the Pic du Midi in the French Alps, the *Laboratoire d'aéronomie*

>
The DVD entitled *'Au cœur du vivant, la cellule'* (Cells: at the heart of life), released in 2005, inaugurated a new collection of topical multimedia DVDs. Designed for specialists as well as for novices, this unique trilingual DVD (French, English, and German) helps viewers discover the basic unit of life.

(Aeronomy Laboratory) in Lannemezan, and the *Laboratoire souterrain* (Underground Laboratory) in Moulis.

7 — The entrance to the Underground Laboratory in Moulis.

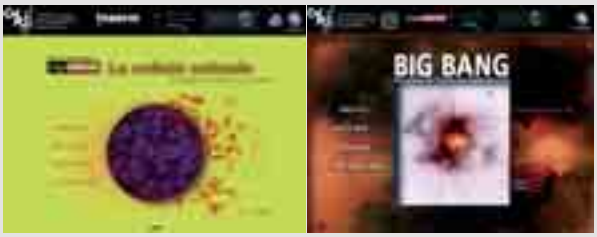
>
CNRS took part in several other exhibitions and conferences including the Paris Book Fair, the European Research & Innovation Exhibition, the Mathematical Culture and Games Fair, etc.

8 — **At the European Research & Innovation Exhibition**, held June 3-5, CNRS participated in the 'Biology/Health care' and 'Information and Communication Sciences and Technologies' centers at the booth of the French Ministry of Research.

ONLINE DOCUMENTS FOR ALL

The CNRS web site is a gold mine of information for anyone interested in science. You can discover or rediscover:

— *Sagascience* multimedia presentations covering major scientific topics. Discover the profusion of French research at CNRS laboratories. The most recent creation in 2005: the Big Bang.
View ten of the collection's presentations on themes ranging from the climate to evolution, cells, or handicaps at:
http://www.cnrs.fr/saga.htm

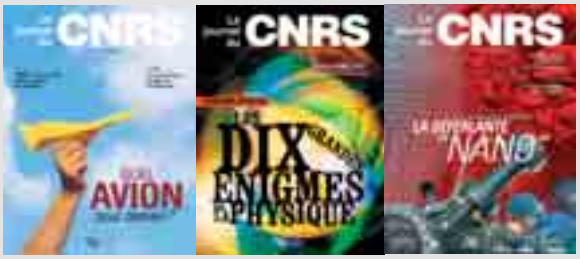


— the *Thema* media kits present the news of interest to media and society. 2005 publications include : *États des dieux* (The Latest on God) *Paris en scènes* (Scenes of Paris) and *Les bleus de la Terre* (This Blue Earth)
Explore the archives of eight *Thema* issues at:
http://www2.cnrs.fr/presse/thema/

— two new educational sites intended for schoolchildren and teachers illustrate key concepts in the secondary school curriculum.
High school chemistry:
http://www.cnrs.fr/diffusion/phototheque/chimieaulycee/
High school physics:
http://www.cnrs.fr/diffusion/phototheque/physiqueaulycee/
In preparation:
High school Life Sciences and High school Earth Sciences

— *Science & Décision* (Science & Decision) presentations, providing answers to everyday questions on scientific issues that impact our daily life.
Presentations on GMOs and biotechnology were published in 2005.
All the presentations are available online at :
http://www2.cnrs.fr/multimedia/

— *Le Journal du CNRS*. Each month the latest science news from CNRS laboratories and an in-depth report on a major theme of research.
http://www2.cnrs.fr/presse/journal/



ALAIN ASPECT

ENLIGHTENING US ABOUT LIGHT

AT THE AGE OF 58, THE CNRS 2005 GOLD MEDALIST HAS CLIMBED SEVERAL EVERESTS IN THE FIELD OF **QUANTUM PHYSICS.** A LOOK BACK AT THE RADIANT CAREER OF THIS BRILLIANT CNRS SENIOR RESEARCHER, MEMBER OF BOTH THE FRENCH *ACADÉMIE DES SCIENCES* AND THE *ACADÉMIE DES TECHNOLOGIES.*

EARLY ACHIEVEMENTS

After his brilliant studies at the *École normale supérieure* (ENS) in Cachan, France and at the *Université d'Orsay* near Paris, he did his military service volunteering as a physics teacher in Cameroon. In 1982, Aspect began a series of now famous experiments that verified 'quantum entanglement' for twin-photon pairs. While he was at it, he and Philippe Grangier managed to produce unique photons at specific points in time -- a worldwide first. He also demonstrated the principle of 'wave-particle duality for a unique photon' which affirms that a photon goes through two points at the same time, even if we can only observe one of those points. He thereby put an end to the debate that had raged between Einstein and Bohr.

THE COLD ATOMS ADVENTURE

In 1985, Claude Cohen-Tannoudji led Aspect into the promising field of cooling atoms by laser. At the Kastler Brossel Laboratory, the two researchers developed a cooling process called 'subrecoil'. To cool down atoms as much as possible, scientists must reduce the atoms' agitation speed as close as possible to what was believed to be an ultimate limit: the 'recoil velocity' of an atom when it emits a single photon. But Aspect broke through this supposed barrier, reaching temperatures lower than one microkelvin, i.e. less than a millionth of a degree above absolute zero.

After this success, he left for the *Institut d'optique* at Orsay where he set up an atomic optics group in 1992. The group's goal is to use laser cooling in order to do with atoms what is already being done with photons in optics.

A NEW DIRECTION

In 1995 there was a revolution in physics: the creation in the United States of the first gaseous Bose-Einstein condensate, a set of ultra-cold atoms united in a single quantum state. His team joined this 'quantum gold rush' and in 1998 managed to create a rubidium condensate. In parallel, CNRS researchers achieved a worldwide first in 2001 by obtaining a condensate of metastable helium atoms[1]. Aspect and his colleagues learned how to detect these atoms separately, 'an advance reminiscent of photon counting in the fifties, the starting point for modern quantum optics'.

SHARING HIS PASSION

This tireless man with numerous scientific lives has managed to sustain his original curiosity and much of his free time is focused on the scientific world. He shares this pleasure with friends, colleagues, and students, as well as with members of congress and captains of industry.

Where will he be a year from now? 'It's laughable to try and plan out a researcher's life,' he says. 'It is such a question of luck, of knowing how to seize opportunities.'

1. A metastable element can take several hours to deenergize.

SCIENTIFIC AWARDS

Once again the scientific achievements and the careers of outstanding researchers, who are or were at one point in their career affiliated with CNRS, were recognized through numerous awards and honors in 2005. Here are a few of the most memorable:

— **A Nobel Prize for French Chemistry.** Among the 2005 Nobel Prize winners, we pay tribute to French chemist **Yves Chauvin,** 75, Senior Researcher Emeritus of the *Laboratoire de chimie organométallique de surface* (the Biomolecular Synthesis Organic Chemistry Laboratory). Chauvin was awarded the prize for his work on metathesis, one of the most useful reactions in organic chemistry. In 1971, this researcher from the *Institut français du pétrole* (IFP - French Petroleum Institute) managed to explain the mechanism for cleaning up certain processes. Those processes are now widely used in the chemical industry, notably for producing drugs and plastic materials.

— For the first time, **the Marconi Prize** was awarded to a Frenchman: **Claude Berrou,** Director of the TAMCIC Laboratory (*Traitement algorithmique et matériel de la communication, de l'information et de la connaissance* - Algorithm and Material Processing of Communication, Information, and Knowledge). He was awarded the prize for his discovery of turbocodes, error correctors that are used to transmit telecom signals.

— **The 2005 INSERM Grand Prize** was awarded to **Bernard Malissen,** Director of the Marseille-Luminy *Centre d'immunologie* (Immunology Center). Among this scientist's major successes: his contribution to the analysis of the mechanisms enabling T lymphocytes to recognize foreign antigens.

— **The European Pharmaceutical Scientist Award** was given to **Pierre Potier** † of the *Institut de chimie des substances naturelles* (Institute of Condensed Matter Chemistry).

— **The Hildebrand Prize for Theoretical Chemistry,** awarded by the American Chemical Society, went to **James T. Hynes**, CNRS Senior

> “IT’S LAUGHABLE TO TRY AND PLAN OUT A RESEARCHER’S LIFE. IT IS SUCH A QUESTION OF LUCK, OF KNOWING HOW TO SEIZE OPPORTUNITIES.”

Researcher in the *Processus d’activation sélective par transfert d’énergie uniélectronique ou radiatif* (Selective Activation by Unielectronic or Radiative Energy Transfer) unit.

— **The Langevin Prize** (Chemistry) of the *Académie des sciences* was awarded to **Claude Delmas**, CNRS Senior Researcher at the *Institut de chimie de la matière condensée* (Institute of Condensed Matter Chemistry) in Pessac, France.

— **The Émile Jungfleisch Prize** of the *Académie des sciences* was awarded to **Siméon Arseniyadis**, CNRS Senior Researcher at the *Institut de chimie des substances naturelles* (Institute of Natural Substances Chemistry) in Gif-sur-Yvette, France.

— **The Grammaticakis-Neuman Prize** of the *Académie des sciences* was awarded to **Bernard Renault**, CNRS Senior Researcher at the *Laboratoire des Neurosciences cognitives et imagerie cérébrale* (Cognitive Neurosciences and Brain Imaging Laboratory) for his study of cerebral mechanisms via electrical and magnetic signal processing.

— **The Michel Montpetit Prize**, of the *Académie des sciences* was awarded to **Pierre Comon**, CNRS Senior Researcher at the *Laboratoire d’informatique des signaux et systèmes* (Computer Signaling and Systems Laboratory) in Sophia-Antipolis, France.

— **The prize for the best young economist** awarded by *Le Monde de l’Économie,* went to **Elyes Jouini**, an academic and specialist in financial markets at the Centre de recherche de mathématiques de la décision (Decision Mathematics Research Center).

— **The L’Oréal-Unesco Prize** was awarded to five female physicists worldwide. One of them was **Dominique Langevin**, CNRS Senior Researcher at the Laboratoire de physique des solides (Solid-State Physics Laboratory) in Orsay, France.

— **A Woman in Gold.** The Whirlpool Femmes en or Prize of Courchevel, in the Research category, was awarded to **Catherine Jeandel**, CNRS Senior Researcher at the *Laboratoire de géophysique et océanographie spatiales* (Space Geophysics and Oceanographic Laboratory) in Toulouse, France.

DIGITAL PUBLICATIONS **THE WAY OF THE FUTURE**

From Assyrian tablets to genomics databases, scientific information is available through an amazingly wide range of media. Accessing that information represents a major challenge, however. As part of the CNRS reforms, DIS (*Direction de l'information scientifique* - Office of Scientific Communications) was created in 2005. Its mission: to provide researchers with the best possible documentary holdings and to disseminate French scientific research as broadly as possible.

In collaboration with other organizations (universities in particular), CNRS has developed and supported several projects that will truly transform the daily activities of research scientists. One example is the HAL platform developed by the *Centre pour la communication scientifique directe du CNRS* (CCSD - CNRS Center for Direct Scientific Communication). This portal for French scientific publications, inspired by the American arXiv system, offers researchers a broad range of services, such as automatic document submission, advanced search engine, online extraction of authors' publications, etc. HAL will considerably increase the visibility of submitted papers and will help institutions set up scientific watchdog systems.

Another major achievement in 2005: the coordinated efforts of CNRS, INRIA (the French National Research Institute for Computing and Automation), INSERM (the French Institute of Health and Medical Research), INRA (the French Institute for Agricultural Research) and CEMAGREF (the French Agricultural and Environmental Research Institute) resulted in the creation of TermSciences, a terminology portal developed by laboratories in Nancy[1]. It is destined to eventually be a reference for scientific and technical vocabulary. The portal lets users browse through a vast terminology database and, starting from a single word, view variations, translations, associations, and gateways to a range of different fields.

We should also underscore the launch of a series of theme-based portals developed by INIST-CNRS (Institute for Scientific and Technical Information), which will enable researchers to access a wide range of documentary holdings that are either free or pay to view. After Bibliovie —a portal with about 3,000 scientific publications intended for researchers in the life sciences— BiblioSHS is now available and offers access to over 2,800 publications in the humanities and social sciences. Bibliostic will soon be ready for Information and Communication Sciences and Technologies.

These major developments are only the most visible part of a long-term program to improve access to scientific information. Some of the projects underway focusing on digitizing audio, video, and handwritten data are joint efforts by major French and European organizations. These efforts will be continued even more intensely in 2006 against a backdrop of vital, in-depth analysis of the future of scientific publications.

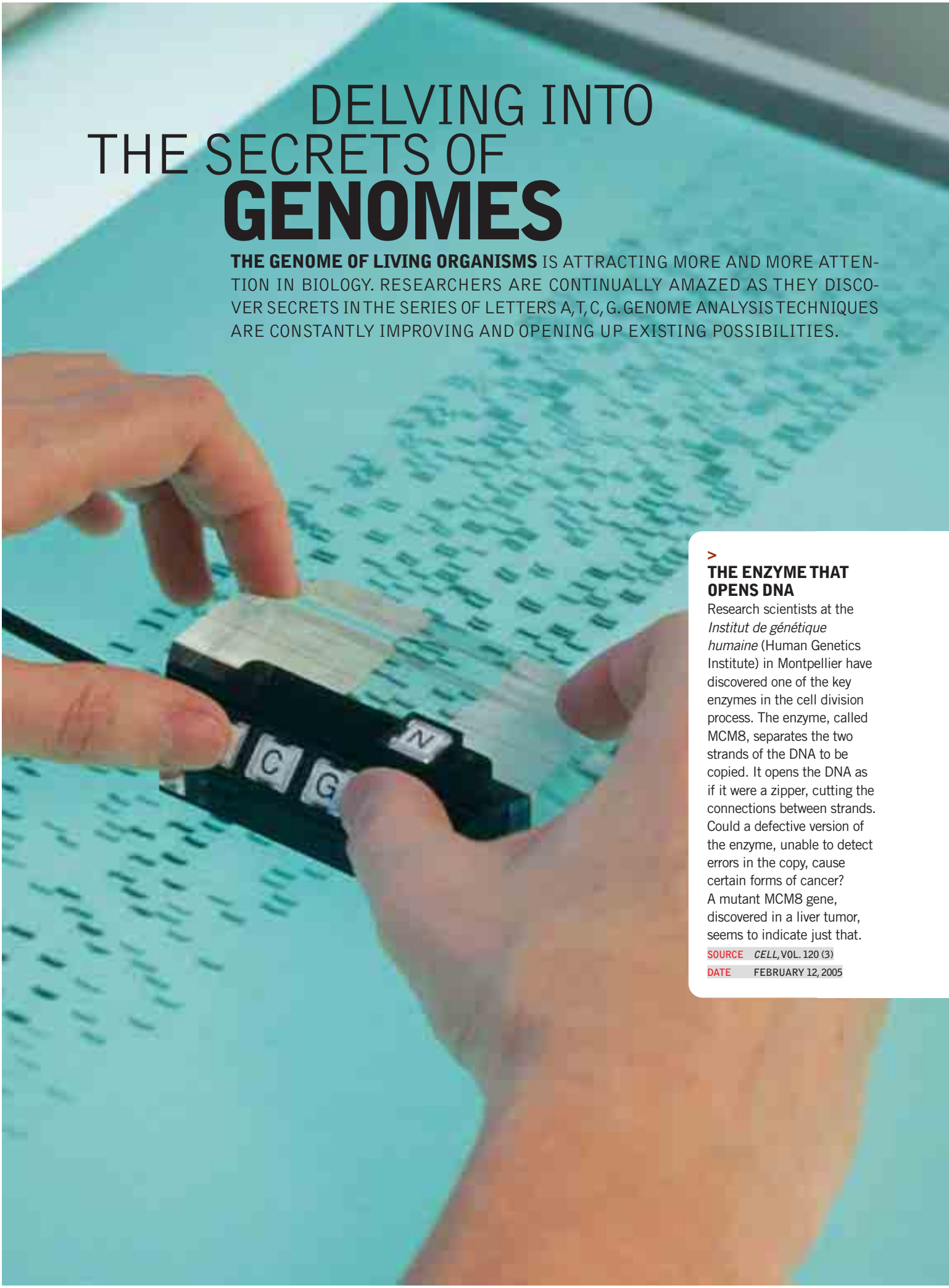
1. INIST (*Institut de l'information scientifique et technique* - Institute for Scientific and Technical Information), LORIA (*Laboratoire lorrain de recherche en informatique et ses applications* - Lorraine Laboratory of IT Research and its Applications) and ATILF (*Analyse et traitement informatique de la langue française* - Computer Analysis and Processing of the French Language).

HAL http://hal.ccsd.cnrs.fr
TERMSCIENCES http://termsciences.inist.fr
BIBLIOVIE http://bibliovie.inist.fr/
BIBLIOSHS http://biblioshs.inist.fr/
BIBLIOSTIC http://bibliostic.inist.fr/

VISIT www.cnrs.fr FOR THE LATEST NEWS ON INFORMATION PRESENTED ON THE FOLLOWING PAGES, IN PRESS RELEASES FROM CNRS, IN2P3 (NATIONAL INSTITUTE OF NUCLEAR AND PARTICLE PHYSICS), INSU (NATIONAL INSTITUTE OF EARTH SCIENCES AND ASTRONOMY) AND FROM THE JOURNAL DU CNRS.

DELVING INTO THE SECRETS OF GENOMES

THE GENOME OF LIVING ORGANISMS IS ATTRACTING MORE AND MORE ATTENTION IN BIOLOGY. RESEARCHERS ARE CONTINUALLY AMAZED AS THEY DISCOVER SECRETS IN THE SERIES OF LETTERS A, T, C, G. GENOME ANALYSIS TECHNIQUES ARE CONSTANTLY IMPROVING AND OPENING UP EXISTING POSSIBILITIES.



> **THE ENZYME THAT OPENS DNA**

Research scientists at the *Institut de génétique humaine* (Human Genetics Institute) in Montpellier have discovered one of the key enzymes in the cell division process. The enzyme, called MCM8, separates the two strands of the DNA to be copied. It opens the DNA as if it were a zipper, cutting the connections between strands. Could a defective version of the enzyme, unable to detect errors in the copy, cause certain forms of cancer? A mutant MCM8 gene, discovered in a liver tumor, seems to indicate just that.

SOURCE *CELL*, VOL. 120 (3)
DATE FEBRUARY 12, 2005

THE FOWL SPERM BANK

A cryobank for keeping sperm and blood samples of domestic birds was created by INRA (the French Institute for Agricultural Research) in order to preserve a genetic diversity that is beginning to run dry. Research scientists will be able to study the genotype of these fowl and identify the genes that resist certain diseases. This will allow breeders to recreate lineages via artificial insemination in the case where a given lineage disappears.

SOURCE *LE JOURNAL DU CNRS*
DATE APRIL 2005

> A RICE DISEASE LAID BARE

The CNRS-Bayer Cropscience mixed laboratory recently completed the full sequencing of the *Magnaporthe grisea* fungus responsible for pyriculariosis – the main rice disease. This micro-organism causes devastating epidemics in all rice-growing regions, and the means for fighting it are insufficient. Analyzing the fungus genome should help scientists better understand the infection process and the interactions between the fungus and rice plants. Thus researchers will be able to develop new methods for fighting this fungus responsible for recurrent human catastrophes.

SOURCE *NATURE*, VOL. 434 (7036)
DATE APRIL 21, 2005

> A GENETIC ID CARD FOR CANCERS

Determining the genetic profile of each form of the cancer by mapping its active and inactive genes: this is the strategy adopted by the CNRS 'Molecular Oncology' team and the Institut Curie. Researchers have developed a new method for exploring genomes that combines DNA microprocessor techniques with powerful statistical software. Scientists can see which genes work together and thereby obtain a genuine ID card for each cancer. This will enable more accurate diagnoses that will facilitate the development of customized treatment for each patient.

SOURCE *CANCER RESEARCH*, VOL. 65 (4)
DATE FEBRUARY 15, 2005

> THE BACTERIA THAT CAME IN FROM THE COLD

How does the *Pseudoalteromonas-haloplanktis* bacteria manage to live in the freezing temperatures of Antarctica? A team has shed light on the mechanisms enabling this bacteria to grow in such a hostile environment. These survival strategies may inspire useful new molecule synthesis methods.

SOURCE *GENOME RESEARCH*, VOL. 15 (10)
DATE OCTOBER 2005

>
TAMING WILD WHEAT

How did we move from wild wheat to its cultivated species like the durum wheat used in pasta or the soft wheat used in bread? A study has both identified the mechanisms behind this tasty evolution for rearranging chromosomes and illustrated the role of the polyploidy in this grain.

SOURCE *THE PLANT CELL*, VOL. 17
DATE APRIL 2005

>
CHOLERA: HOW A VIRUS MAKES BACTERIA DEADLY

New information has surfaced about the cholera virus and vibrio that cause deadly cholera epidemics in poor countries. CNRS research scientists and the *Institut Pasteur* have revealed the mechanism whereby the virus takes over the cellular machinery of its host. It fools the bacteria's enzymes by folding its DNA, enabling the parasite to meld into its host's genome and multiply. As for the bacteria, it begins to produce the cholera toxin of the disease.

SOURCE *MOLECULAR AND CELLULAR BIOLOGY*
DATE SEPTEMBER 2005

GENOME ANALYSIS: NEW SOLUTIONS

IRISA (the *Institut de recherche en informatique et systèmes aléatoires*—Institute for Research on Computing and Random Systems) has created a prototype providing fast access to gigantic genome databases, which are doubling in size every twelve months. This system distributes the genome text across 48 hard disks that are read simultaneously. At the same time, a hardware filter selects only the interesting sequences. Now it is possible to find a needle in a haystack !

SOURCE *LE JOURNAL DU CNRS*
DATE MARCH 2005

>
FATHER AND MOTHER CHROMOSOMES

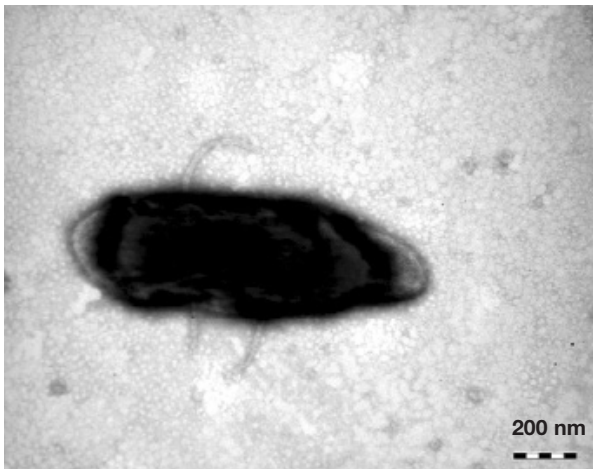
Paternal and maternal chromosomes have a different structure in very young embryos. That is the conclusion of CNRS research scientists who looked into the modifications of the father's DNA from fertilization to the first steps of embryogenesis.

SOURCE *NATURE*
DATE OCTOBER 27, 2005

>
THE SEX LIFE OF *R. FELIS*

Rickettsia felis is a sexual bacteria. A CNRS team has sequenced its genome and shown that the rapid evolution of this intracellular parasite in cat fleas is due to the exchange of genetic material between individuals. Scientists used to believe that the mechanism was instituted by this bacteria family.

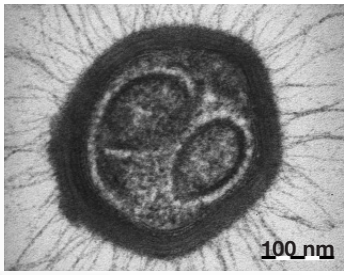
SOURCE *PUBLIC LIBRARY OF SCIENCE BIOLOGY*
DATE JULY 2005



>
THE MYSTERY SURROUNDING A GIANT VIRUS

Mimivirus, the world's largest virus, continues to stupefy virologists. Researchers at the *Information génomique et structurale* (Structural and Genomics Information) laboratory in Marseille, who helped discover the virus in 2003, have analyzed its genome and raised new questions. Mimivirus does not appear to be a simple, randomly constituted 'bag of genes', as one used to think. Half of its genes have a common origin, probably a very ancient one, and its genome has remained very homogeneous throughout the course of its evolution. Mimivirus may represent a new branch in the tree of living organisms, alongside bacteria and eukaryotes.

SOURCE *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES,* VOL. 102 (41)
DATE 11 OCTOBRE 2005



ALL FOR ONE AND ONE FOR ALL

The *Resogen program,* initiated by the French National Genopole Network, makes shared resources available to laboratories. For example, they can use thin glass strips printed with 25,000 probes to trap the messenger RNA of mice and men. These strips are vital for studying cells and tissue. Resogen will soon offer laboratories specific, reactive software for gene silencing.

SOURCE *LE JOURNAL DU CNRS*
DATE FEBRUARY 2005

THE BRAIN'S GPS

We would be lost without the cerebellum ! Researchers at the *Laboratoire de physiologie de la perception et de l'action* (Laboratory of Physiology of Perception and Action) have analyzed the way this region of the brain is used in navigation. It appears that the cerebellum continuously corrects errors between the desired and the current trajectory. This 'brain GPS' is also one of the first brain functions affected by aging and by certain neurodegenerative diseases. This research sheds new light on the emergence of complex functions such as navigation and trajectory optimization.

SOURCE *NATURE NEUROSCIENCE*, VOL. 8 (10)
DATE OCTOBER 2005

CELL MEMBRANES: OBSERVING THEIR ACTIVITY

A real-time view of the endocytosis phenomenon whereby cells capture molecules: this is the major achievement of an international team of researchers. Using fluorescent proteins, they observed the formation of vesicles and were the first to dynamically analyze how molecules enter cells.

SOURCE *CELL*, VOL. 121 (4)
DATE MAY 20, 2005

INTERACTION NETWORK

A map of protein-protein interactions was developed by a mixed team studying the fruit fly. Interactions between proteins involved in the development of cancer in humans are of particular interest to researchers, who are working to identify new therapeutic targets.

SOURCE *GENOME RESEARCH*, VOL. 15 (3)
DATE MARCH 1, 2005

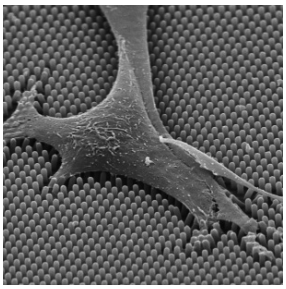
JOURNEY TO THE CENTER OF THE CELL

CELLS ARE THE SMALLEST UNIT OF LIVING ORGANISMS, BUT THEY ARE NONETHELESS COMPLEX. EVERY DAY RESEARCHERS LEARN A LITTLE MORE ABOUT CELLULAR PROCESSES. THE ULTIMATE TARGET: NEW LEADS FOR TREATING DISEASES SUCH AS CANCER, PRION DISEASES, OR NEURODEGENERATIVE DISEASES.

A BED OF NAILS FOR CELLS

What forces do cells use to move? To answer this, biologists and physicists have joined forces to develop a sort of bed of nails, a surface made up of minuscule columns acting as sensors. This tool makes it possible to measure the minute forces at work when cells move.

SOURCE *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*
DATE FEBRUARY 15, 2005



PRIONS REVEAL THEIR SECRETS

A major achievement: an international team has discovered the link between the structure of a prion in the *Podospora anserina* fungus and its infectious characteristics. This is a vital step in understanding the mechanisms that make these proteins infectious agents which transmit their abnormal configuration.

SOURCE *NATURE*, VOL. 435 (7043)
DATE JUNE 9, 2005

BIOLOGICAL CLOCK: THE ROLE OF PROTEINS

A new mechanism has been discovered for controlling the biological circadian rhythm (related to light/dark cycles). Research scientists have demonstrated the importance of regulating certain proteins whose concentration varies over the course of the day.

SOURCE *SCIENCE*, VOL. 309 (5735)
DATE AUGUST 26, 2005

RHYTHMS IN THE LIFE OF CANCER CELLS

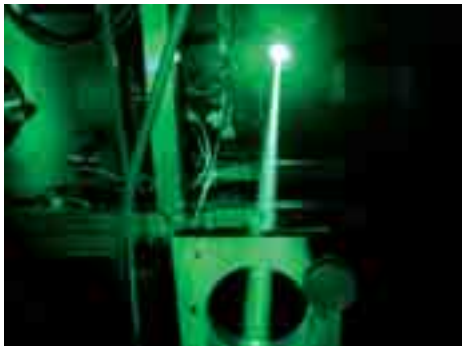
There is a discrepancy between cancerous cells and healthy cells in the biological clock linked to the alternate light/dark cycles. So concluded a team studying the role of biological clocks in the cell division and cell death cycles.

SOURCE *THE FASEB JOURNAL*
DATE FEBRUARY 2005

LASER CUTTING

Nothing is more accurate than a laser for cutting up proteins! So say research scientists at the *Laboratoire de photophysique moléculaire* (Molecular Photophysics Laboratory) who, by adjusting the time between two laser pulses, can select the exact spot for cutting up these macromolecules. The researchers offer a new technique to biologists exploring the nature of proteins to help better understand their role.

SOURCE *PHYSICAL CHEMISTRY CHEMICAL PHYSICS*, VOL. 7
DATE 2005



EXPLORING THE ANIMAL WORLD

THE ANIMAL WORLD REMAINS A SOURCE OF INSPIRATION FOR NEW TECHNOLOGIES. MOTION DETECTORS, INTELLIGENT ROBOTS... EXAMPLES ABOUND! RESEARCHERS ARE TRYING TO UNDERSTAND HOW THE WORLD'S DIFFERENT SPECIES LIVE AND EVOLVE.

>
THE WAR OF THE SEXES AMONG LITTLE FIRE ANTS

Research scientists have discovered a novel reproduction method in *Wasmania auropunctata*, also called the little fire ant. Both queens and males are clones of the previous generation. Only sterile workers result from sexual reproduction. A strange way of doing things, due no doubt to the very intense competition for transmitting genes between males and females.

SOURCE *NATURE*, VOL. 435 (7046)
DATE JUNE 30, 2005

>
A WASP'S DILEMMA: EAT OR LAY EGGS

The *Eupelmus vuilletti wasp* must make a hard choice in order to survive: either eat its prey, or lay eggs on the prey's body. Researchers, who studied the wasp nonstop to determine its energy balance, have found that the insect manages its resources very carefully. The wasp's life expectancy varies between 8 and 15 days depending on the choices it makes.

SOURCE *ECOLOGY*
DATE MARCH 2005

CRICKETS AND NEW TECHNOLOGIES

Nature might inspire us to make new technological advances. As part of the European programs studying the perception of air movements in Cicada and Cilia insects, research scientists went to Gabon to find a species of cave-dwelling crickets. They are investigating the extraordinary performance of their air movement sensors.

SOURCE *LE JOURNAL DU CNRS*
DATE NOVEMBER-DECEMBER 2005

>
AIR-CONDITIONED TUBES FOR DEEP-OCEAN WORMS

What is the secret that enables Pompeii worms to live 2,500 meters under the sea in water columns where temperatures rise above 120°C? Research scientists have demonstrated that the worms ventilate the tubes they live in to cool their environment. This air conditioning system also benefits the bacteria eaten by the worms.

SOURCE *DEEP SEA RESEARCH,* PART I, VOL 52
DATE JUNE 2005

>
THE WAR OF THE QUEENLESS ANTS

About two hundred species of ants do not have a predefined queen. In order to determine which ant will have the privilege of reproducing, high-ranking individuals in the nest organize a fight to determine the future egg-layer. This is one of the results obtained by CNRS researchers studying *Streblognathus peetersi*, a South African species.

SOURCE *LE JOURNAL DU CNRS*
DATE FEBRUARY 2005

ZOOMING INTO THE HEAD OF A MOUSE

Small animal imaging: **this is the name of an interdisciplinary program that has developed an innovative technique for probing almost the entire depth of the cerebral cortex of mice. Using a biphotonic microscope, research scientists in Grenoble have obtained a very high resolution three-dimensional image of the mouse's brain.**

SOURCE *LE JOURNAL DU CNRS*
DATE JULY-AUGUST 2005

>
MANIPULATING GRASSHOPPERS

Nematomorpha, parasitic worms living in grasshoppers and crickets, eventually drive their hosts to suicide by causing them to leap into water. A team has illustrated the complex chemical manipulations that the parasites perform on the host's nervous system to modify its behavior.

SOURCE *PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON,* ONLINE
DATE SEPTEMBER 2, 2005

>
NO CROSSBREEDING OF PYRALID MOTHS

The probability of a European corn borer mating with a sage-brush moth is less than 5%. Thus there is almost no intermingling between these two groups of moths of the same species, despite the fact that they are morphologically identical. This is the conclusion of research scientists at the Toulouse Ladybio who studied the phenomenon of speciation: how two groups of a given species stop reproducing with one another, and eventually diverge genetically. The purpose of this research is to clarify the role of food resources where there is genetic divergence within a species. It is one of the rare cases where it was possible to quantify this phenomenon in nature.

SOURCE *SCIENCE,* VOL. 308 (5719)
DATE APRIL 8, 2005

>
BEES HAVE A SENSE OF SMELL

A team of research scientists in Toulouse has managed to have bees memorize up to sixteen different odors. Using calcium imaging techniques to observe the bees' miniscule brains, researchers have demonstrated a direct correlation between the insects' cerebral activity and their olfactory sensation.

SOURCE *PUBLIC LIBRARY OF SCIENCE BIOLOGY,* VOL. 3
DATE APRIL 2005

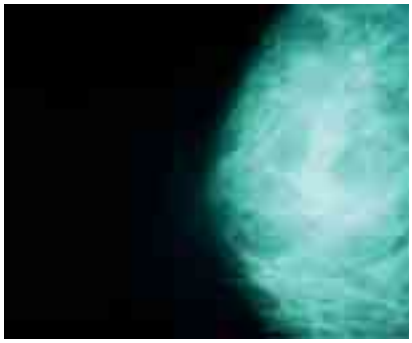
THE CRUSADE AGAINST **CANCER**

RESEARCHERS ARE USING AN EXTENSIVE RANGE OF STRATEGIES TO FIGHT CANCER: THEY ARE LEARNING TO BETTER UNDERSTAND THIS DISEASE AND HAVE DEVELOPED A LARGE ARRAY OF DETECTION AND DEFENSE TOOLS.

BREAST CANCER: MONITORING SENTINEL LYMPH NODES

A new hope for women: researchers in Strasbourg have developed a method for improving breast cancer surgery using a probe and a gamma camera allowing easy identification of sentinel lymph nodes, which are the first intermediary in the spreading of metastatic tumors. Using current techniques, surgeons remove these lymph nodes first. But they are difficult to detect because their number and location vary from one woman to the next. This method, soon on the market, makes it possible to find them all.

SOURCE *BREAST CANCER RESEARCH AND TREATMENT*, VOL. 89
DATE FEBRUARY 2005



A LINK BETWEEN DIABETES AND PANCREATIC CANCER

For the first time, common genetic mechanisms between two diseases of the pancreas – Type 2 diabetes and cancer of the pancreas – have been revealed. This discovery was made by an international team including research scientists from the *Laboratoire de génétique des maladies multifactorielles* (Genomics and Molecular Physiology of Metabolic Diseases Laboratory). Scientists already knew that diabetes, which affects one person out of ten in France, was a risk factor for pancreatic cancer, but the mechanisms were not understood. Now we know that they involve a growth factor which activates the KLF 11 protein, a transcription factor that controls both the proliferation of exocrine cells and the function of endocrine cells.

SOURCE *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*, VOL. 102 (11)
DATE MARCH 15, 2005

A UNIVERSAL WEAPON AGAINST CANCER

To find a way to eliminate tumor cells without affecting other cells applicable to all types of cancer: this is the goal of some cancer biology researchers. A team at the *Institut de génétique et de biologie moléculaire et cellulaire* (Institute of Genetics and Molecular and Cellular Biology) in Strasbourg recently completed an important step: it demonstrated the key role of a membrane protein called TRAIL, which causes cell death. Its induction causes the death of cancer cells only. According to the research scientists, any therapy able to induce TRAIL could constitute a universal weapon against tumors.

SOURCE *NATURE MEDICINE*
DATE JANUARY 2005

CERVICAL CANCER: HOPE FOR A VACCINE

Serious leads have emerged for a vaccine against cervical cancer, the second most common form of cancer among women. It was developed by research scientists from CNRS, INSERM (the French Institute of Health and Medical Research), the Institut Pasteur, and the BT Pharma company. This therapeutic vaccine attacks the human papilloma virus which causes most forms of cancer. In mice the vaccine resulted in a total regression of the tumor in 100% of the animals tested. Other results were obtained using another vaccine against an oncoprotein responsible for 12% of cervical cancers. Clinical trials combining both vaccines will be launched this year by BT Pharma.

SOURCE *CANCER RESEARCH*, VOL. 65 (2)
DATE JANUARY 15, 2005

MUSCLING THEIR WAY IN RESEARCH

RESEARCH IS STRONG-ARMING ITS WAY INTO MUSCLES. RESEARCH SCIENTISTS HAVE INVENTED NEW METHODS FOR REPAIRING OR REGENERATING MUSCLE TISSUE IN ORDER TO TREAT PATHOLOGIES SUCH AS MYOPATHIES.

BULKING UP WITH ADIPOSE CELLS

Fatty tissue, which stores our body fat, has also proven to be a genuine reservoir of stem cells, immature cells able to give birth to muscular, cardiac, vascular, bone cells, etc. Research scientists at CNRS and INSERM (the French Institute of Health and Medical Research) have managed to regenerate muscle tissue by transplanting adipose cells in sick mice without causing rejection. This advance offers great hope for treating pathologies such as Duchenne's muscular dystrophy, a hereditary disease causing inexorable muscular atrophy.

SOURCE *JOURNAL OF EXPERIMENTAL MEDICINE*
DATE MAY 2, 2005

DECRYPTHON: APPLYING COMPUTING POWER TO GENOMICS

Strength in numbers. The French Muscular Dystrophy Association, CNRS, and IBM launched the Decrypthon program on March 15, 2005. Its leading innovation is two computer networks that will provide the number-crunching power required for complex research programs in genomics and proteomics. It should accelerate our understanding of genetic diseases, and muscular diseases in particular.

SOURCE *LE JOURNAL DU CNRS*
DATE APRIL 2005

CELL GLUE

Research scientists have described a new mechanism whereby cells 'stick' together to form the epithelium that covers all the cavities in our bodies. They hope to better understand the risks caused by the loss of this adhesive function, which can specifically cause metastatic tumors.

SOURCE *DEVELOPMENTAL CELL*
DATE SEPTEMBER 2005

REPAIR SATELLITE CELLS

Researchers have managed to isolate adult muscle stem cells, the satellite cells able to repair muscles very efficiently. Excellent muscular regeneration was obtained in mice with muscular dystrophy by grafting just 20,000 cells.

SOURCE *SCIENCE,* VOL. 309 (5740)
DATE SEPTEMBER 1, 2005

UNITED THEY STAND

All the leading specialists in muscle biology were in Clermont-Ferrand in February for the launch of *Myores,* Europe's leading network of excellence studying both normal and pathological muscle development. This network, which includes CNRS, benefits from a five year, €5 million European financing program.

SOURCE *LE JOURNAL DU CNRS*
DATE APRIL 2005

>
A PLANT TO ERADICATE MALARIA

What is the worst enemy of plasmodium, the parasite of malaria? Artemisia, an Asian sage brush. Research scientists in Toulouse have described the mechanism by which artemisin, a molecule extracted from the plant, kills the parasite. These results pave the way for the creation of new types of antimalarial drugs.

SOURCE *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*, ONLINE

DATE SEPTEMBER 5, 2005

>
HOW MALARIA ATTACKS THE BRAIN

Cerebral malaria, the most dangerous form of malaria, occurs when the disease attacks the brain. CNRS researchers have used in vivo IRM on mice to analyze the physio-pathological aspects of this illness. Apparently it causes death through a major edema in the brain, which leads to compression of the arteries.

SOURCE *JOURNAL OF NEUROSCIENCE*

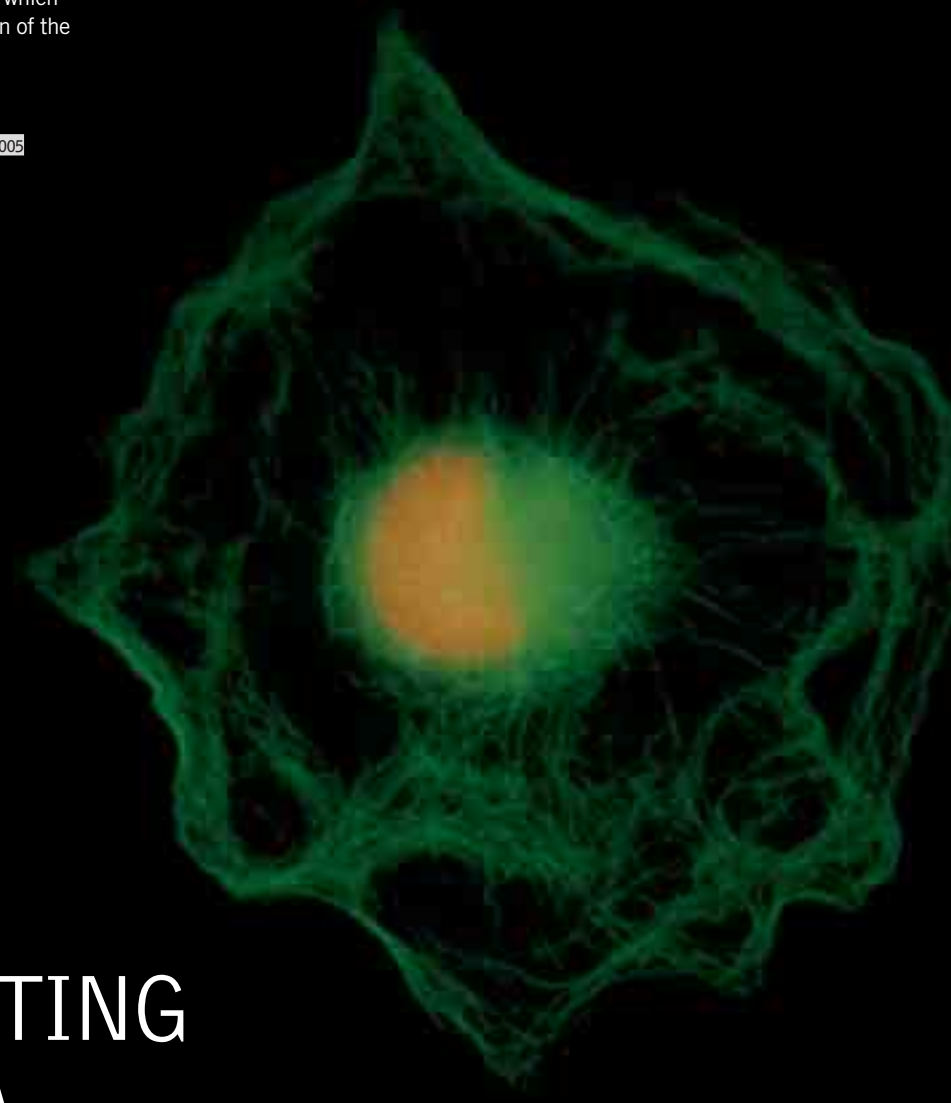
DATE SEPTEMBER 2005

USING COMPUTER SCIENCE TO ATTACK MALARIA

One million potential drugs tested in one month: that is the feat achieved by the Wisdom project using the EGEE European computing grid, which combines 1,000 computers in a network. The experiment identified the molecules with the most promising profiles by measuring their probability of linking to and altering a target protein.

SOURCE PRESS RELEASE

DATE OCTOBER 5, 2005



FIGHTING MALARIA

MALARIA WREAKS HAVOC IN NUMEROUS DEVELOPING COUNTRIES. BUT THE PLASMODIUM PARASITE, TRANSMITTED BY MOSQUITOES, FINDS SEVERAL ENEMIES IN ITS WAY – PLANTS OR KILLER CELLS – WHICH PROVIDE OPPORTUNITIES FOR NEW THERAPIES.

ATTACKING DRUG ADDICTION

TO HELP IN THE FIGHT AGAINST DRUG DEPENDENCY PROBLEMS, SCIENTISTS ARE STUDYING THE BRAIN, WHICH REPRESENTS THE KEY TO MOTIVATION AND WITHDRAWAL.

>
USING KILLER CELLS TO FIGHT PLASMODIUM

Our bodies defend themselves when they are infected by plasmodium, the parasite responsible for malaria. Research scientists have demonstrated that NK (Natural Killer) cells act by alerting other cells in the immune system. This mechanism should be taken into account in the search for new forms of therapy.

SOURCE *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*, ONLINE
DATE OCTOBER 3, 2005

>
TRANSVESTITE PLASMODIUM

Plasmodium quickly disguises itself by changing its immunological traits in order to fool the immune system. An international team discovered this mechanism which causes our body's defenses to become inefficient.

SOURCE *CELL*, VOL. 121 (11)
DATE APRIL 8, 2005

>
RELAPSES IN MORPHINE-ADDICTED RATS

For an ex-addict, returning to an environment associated with withdrawal can trigger an intense desire for the drug. Research scientists re-exposed morphine-dependent rats deprived of the drug to withdrawal-related stimuli. This reactivated some of the neuronal circuits used in the withdrawal process.

SOURCE *THE JOURNAL OF NEUROSCIENCE*
DATE FEBRUARY 9, 2005

>
OF MICE, MEN, AND COCAINE

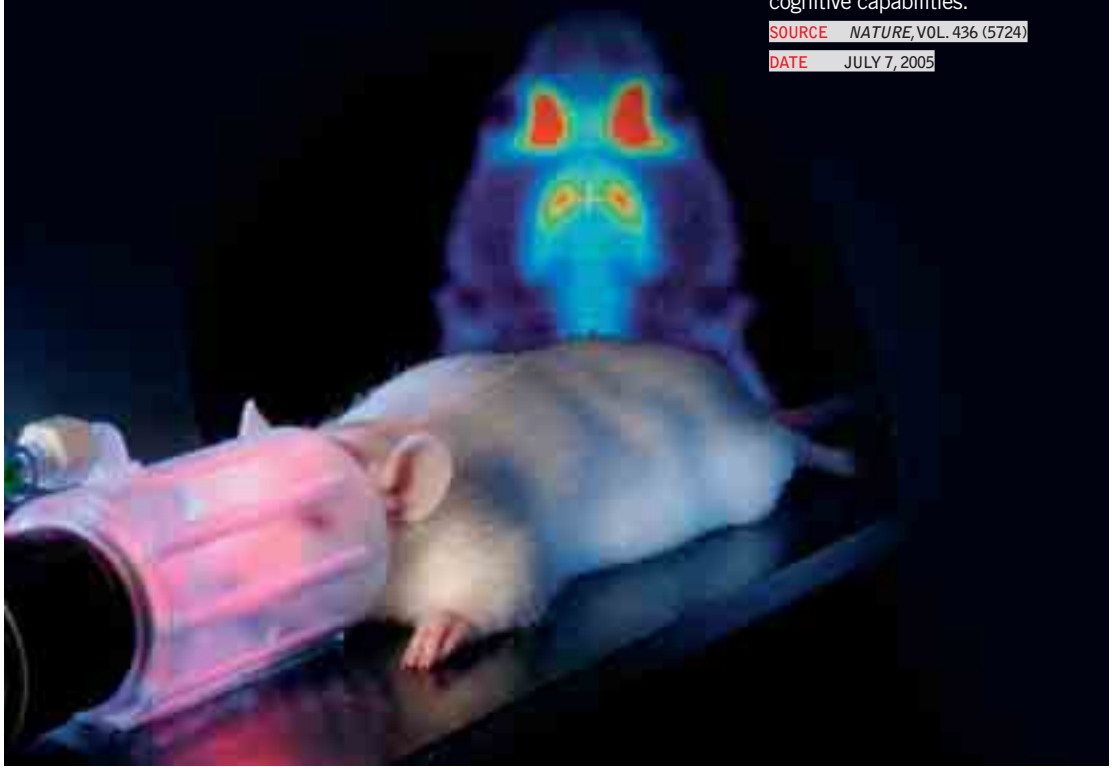
Will cocaine dependency problems be solved by a surgical operation similar to the one already used for patients with Parkinson's disease? Maybe so, according to CNRS research scientists: rats have shown a clear reduction in their motivation for the drug after this operation on their brain's subthalamic nucleus.

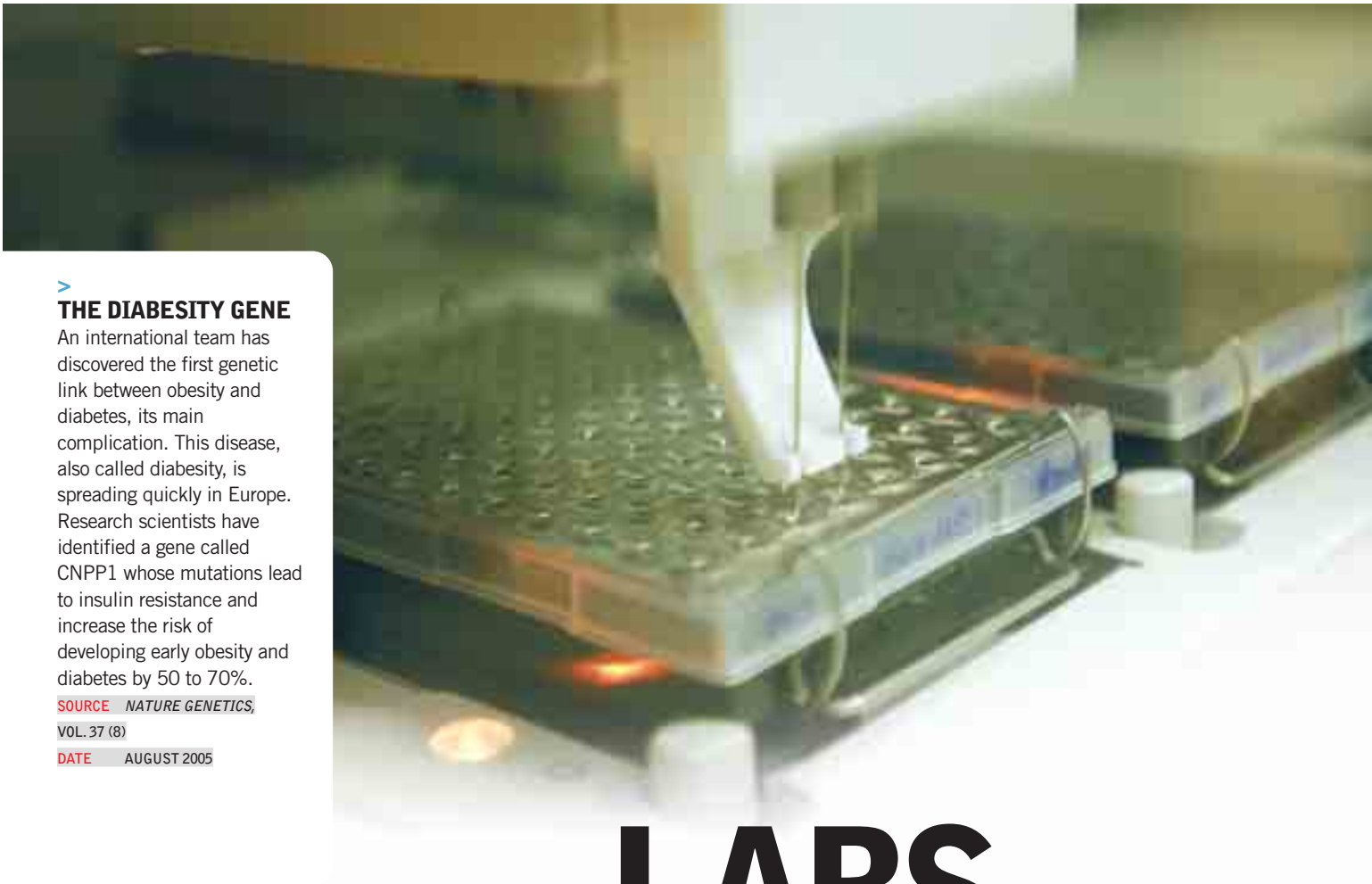
SOURCE *NATURE NEUROSCIENCE*
DATE APRIL 2005

>
NICOTINE-DEPENDENT MICE

Research scientists have shown how nicotine dependence occurs in mice. It is linked to a receptor molecule, the ß2 subunit of the nicotine receptor involved in individuals' cognitive capabilities. This is the first time that an anatomical and molecular link has been demonstrated between nicotine dependence and cognitive capabilities.

SOURCE *NATURE*, VOL. 436 (5724)
DATE JULY 7, 2005





>
THE DIABESITY GENE

An international team has discovered the first genetic link between obesity and diabetes, its main complication. This disease, also called diabesity, is spreading quickly in Europe. Research scientists have identified a gene called CNPP1 whose mutations lead to insulin resistance and increase the risk of developing early obesity and diabetes by 50 to 70%.

SOURCE *NATURE GENETICS*, VOL. 37 (8)

DATE AUGUST 2005

LABS ON EVERY FRONT

VIRUSES, BACTERIA AND OTHER GERMS, GENETIC AND NEURODEGENERATIVE DISEASES... ALL REPRESENT SERIOUS HEALTH THREATS. RESEARCHERS ARE RALLYING TO FIGHT THEM AND TO INVENT THE THERAPIES OF THE FUTURE.

>
A NEW KILLER OF PATHOGENS

A new breakthrough in the battle against nosocomial diseases and Legionnaires' Disease: research scientists from CNRS and the Université Louis-Pasteur in Strasbourg have invented a device that destroys 99% of the bacteria, fungi and viruses in the air. It will make it possible to sterilize hospitals, buses, or aircraft. The device, a tube-shaped reactor, uses titanium dioxide activated by ultraviolet light as an oxidizing agent. It alters the nature of the molecules of any germ going through the tube. Initial tests on the *E. Coli* bacteria are very promising, and further tests are planned on other species.

SOURCE *CHEMICAL COMMUNICATIONS*

DATE APRIL 22, 2005

>
A GUARDIAN ANGEL PROTEIN

CNRS researchers have shed new light on the Chk1 protein that protects us against abnormal cellular growth. Known to block the division of cells with a damaged genome, the protein also controls the quality of the genetic information at the end of the cell division process, and slows the separation of both sets of chromosomes if lesions are present.

SOURCE *MOLECULAR AND CELLULAR BIOLOGY*, VOL. 25 (17)

DATE SEPTEMBER 2005

>
CONTROLLING CELL DEATH

Controlling apoptosis, which is linked to several diseases, may no longer be a pipe dream. Research scientists have managed to block the programmed cell death mechanism by inhibiting TNA, a mitochondrial protein. The immediate result: an improved prognosis for three diseases, including sudden hepatitis.

SOURCE *JOURNAL OF CLINICAL INVESTIGATION*

DATE JUNE 2005

HOW PROTEINS CUT YOUR APPETITE

A team of researchers has determined the origin of the appetite-depressant effect of proteins, used in certain diets and to treat obesity. Ingesting proteins stimulates glucose synthesis by the intestine and thereby generates a satiation signal for the brain.

SOURCE *CELL METABOLISM*, VOL. 2 (5)
DATE NOVEMBER 2005

STEM CELLS AGAINST PARKINSON'S

Will stem cell eventually provide a new weapon against Parkinson's Disease? Research scientists have managed to provoke in mice the differentiation of adult neural stem cells in neurons that secrete dopamine, the molecule missing in this pathology.

SOURCE *NATURE NEUROSCIENCE*, VOL. 8 (7)
DATE JULY 2005

ONLINE DIAGNOSES

Physicians and research scientists working in a network over the Internet to analyze MRI images? That is what the *Laboratoire de résonance magnétique des systèmes biologiques* (Biological System Magnetic Resonance Laboratory) and the *Service commun d'analyses spectroscopiques* (Joint Spectroscopic Analysis Office) suggest. The two units worked together over an ADSL connection to remotely perform an MRI angiography examination (vessel specific imaging).

SOURCE *LE JOURNAL DU CNRS*
DATE APRIL 2005

A TELESCOPE INTO YOUR EYES

Astronomy has entered the hospital: research scientists at the *Laboratoire d'études spatiales et d'instrumentation en astrophysique* (Laboratory for Space Studies And Astronomical Instrumentation) are developing a new imager that will make it possible to observe the retina with unparalleled accuracy. The idea is to use adaptive optics which enable astronomers to obtain good images of the sky despite atmospheric disturbance. In this application it will correct distortions due to the particularities of individual eyes.

SOURCE PRESS RELEASE
DATE MARCH 31, 2005

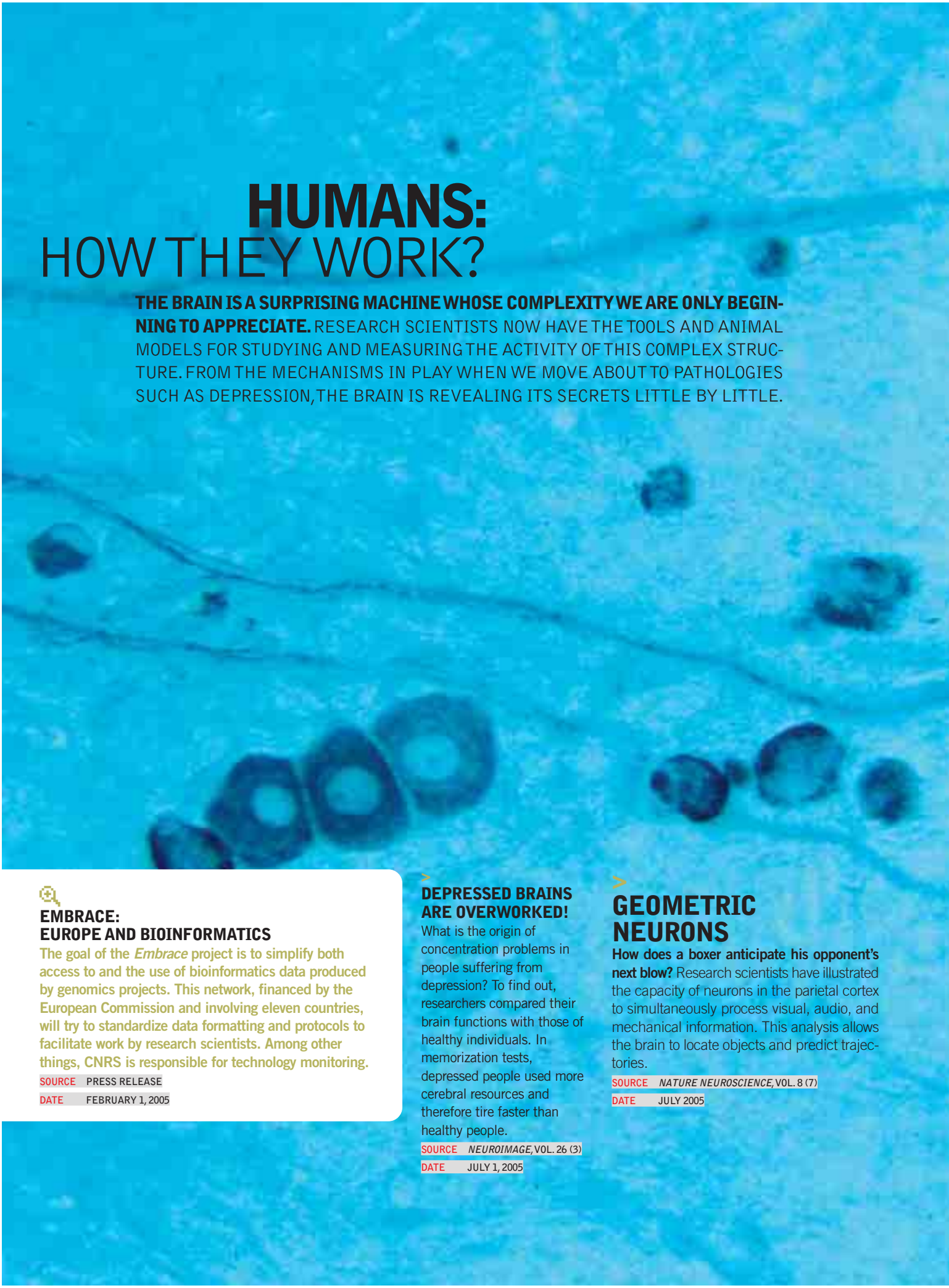
PARKINSON'S EXPOSED

Today Parkinson's Disease can be treated by electrical stimulation of the subthalamic nucleus, a cerebral structure. Research scientists have demonstrated why this therapy works: the stimulation inhibits the axons of the structures related to the subthalamic nucleus and desynchronizes its neurons.

SOURCE *BRAIN*, ONLINE
DATE AUGUST 25, 2005

HUMANS: HOW THEY WORK?

THE BRAIN IS A SURPRISING MACHINE WHOSE COMPLEXITY WE ARE ONLY BEGINNING TO APPRECIATE. RESEARCH SCIENTISTS NOW HAVE THE TOOLS AND ANIMAL MODELS FOR STUDYING AND MEASURING THE ACTIVITY OF THIS COMPLEX STRUCTURE. FROM THE MECHANISMS IN PLAY WHEN WE MOVE ABOUT TO PATHOLOGIES SUCH AS DEPRESSION, THE BRAIN IS REVEALING ITS SECRETS LITTLE BY LITTLE.



EMBRACE: EUROPE AND BIOINFORMATICS

The goal of the *Embrace* project is to simplify both access to and the use of bioinformatics data produced by genomics projects. This network, financed by the European Commission and involving eleven countries, will try to standardize data formatting and protocols to facilitate work by research scientists. Among other things, CNRS is responsible for technology monitoring.

SOURCE PRESS RELEASE
DATE FEBRUARY 1, 2005

DEPRESSED BRAINS ARE OVERWORKED!

What is the origin of concentration problems in people suffering from depression? To find out, researchers compared their brain functions with those of healthy individuals. In memorization tests, depressed people used more cerebral resources and therefore tire faster than healthy people.

SOURCE *NEUROIMAGE*, VOL. 26 (3)
DATE JULY 1, 2005

GEOMETRIC NEURONS

How does a boxer anticipate his opponent's next blow? Research scientists have illustrated the capacity of neurons in the parietal cortex to simultaneously process visual, audio, and mechanical information. This analysis allows the brain to locate objects and predict trajectories.

SOURCE *NATURE NEUROSCIENCE*, VOL. 8 (7)
DATE JULY 2005

THE MYSTERY OF BOSRA WATER

A Franco-Syrian team began a new excavation campaign at the ancient city of Bosra, which in 106 A.D became the capital of the Roman province of Arabia. The goal is to determine whether the immense aqueduct discovered by the same researchers last year actually dates from that era. This would solve the mystery of how water was supplied to a growing city with increasingly numerous thermal baths and fountains.

SOURCE *LE JOURNAL DU CNRS*
DATE OCTOBER 2005

A GIANT SALAMANDER DISCOVERED IN THE NATURAL HISTORY MUSEUM

In the back of a drawer in the Natural History Museum, a young CNRS paleontologist found a jaw fragment of the largest salamander ever to walk the earth. This seven-meter monster lived two hundred million years ago in Southern Africa. Discovered in Lesotho in 1970, the fossil had been filed among the wrong group of amphibians. After studying its morphology and the distinctive features of its teeth, the paleontologist reclassified it among the temnospondyli. He then virtually rebuilt the body of this giant predator of the Jurassic swamps.

SOURCE *LE JOURNAL DU CNRS*
DATE JULY-AUGUST 2005

THE TALE OF MAN, THE TALE OF MEN

FROM THE DISCOVERY OF TOUMAÏ, THE OLDEST KNOWN HOMINID, TO THE STUDY OF THE NEOLITHIC REVOLUTION – NOT TO MENTION EXCAVATIONS AT ROMAN OR GALLIC SITES – ARCHAEOLOGISTS TELL THE LONG AND TURBULENT STORY OF MANKIND.

TOUMAÏ IN THE HEADLINES

***Sahelanthropus tchadensis*, better known as Toumaï,** is the oldest known species in the human family tree, dating back six to seven million years. As featured on the cover of Nature, Michel Brunet and his colleagues at the Franco-Chadian Paleoanthropology Mission have discovered new fossils, including a skull with a capacity of 350 cm^3 as well as jaw-bone fragments. They also created a 3-D reconstruction of the hominid's skull and performed a morphometric analysis. Toumaï, standing between 105 and 120 centimeters tall and with characteristics comparable to other hominids, is the oldest known member of the Hominid family outside Eastern Africa.

SOURCE *NATURE,* VOL.434 (7033)
DATE APRIL 7, 2005

SAVING A NEOLITHIC SITE

Emergency excavation begun at the end of 2004, south of the French city of Nîmes, revealed an extraordinary find dating from about 7,000 years ago. Ceramics fragments, carved silex and quartz, jewels and perforated shells illustrating the daily life of the first peasants in southern France were spared from construction on the expansion of a commercial area.

SOURCE *LE JOURNAL DU CNRS*
DATE MAY 2005

GALLIC COUNTERFEITERS

A research scientist in Orléans, France, unveiled the techniques used to produce fake coins in third century Roman Gaul. She discovered that the forgers used only 2% silver in their coins, while official coins contained 15%.

SOURCE *LE JOURNAL DU CNRS*
DATE JANUARY 2005

MAN

FOOD QUALITY THROUGH THE AGES

Food safety issues have been in the headlines. Using the production of four quality French agricultural products (wine, meat, butter, and milk), a researcher studied the legal and economic history of food quality throughout Europe.

SOURCE *HISTOIRE DE LA QUALITÉ ALIMENTAIRE* (XIXe-XXe SIÈCLES) Alessandro Stanziani / publisher: Seuil / coll. « Liber » / 378 p.

DATE JANUARY 2005

THE ETHNOLOGY OF CLOSINGS

When Cellatex, the Laennec Hospital in Paris, or the Folies Bergères close, what is really happening? Ethnologists have shown how the staging (layoffs, strikes, celebrations) that occurs with the closing of a public institution gives the location a heritage value by making it a symbol of the myth of the golden age.

SOURCE *FERMETURES, CRISES ET REPRISES* Anne Monjaret / Revue Ethnologie française / tome XXXV / publisher: Puf / 192 p.

DATE OCTOBER 2005

>
IS THE CONSUMER THE CENTER OF THE WORLD?

Is the consumer truly central to western society? In fact, it is more the employer organizations, politicians, and marketing experts that speak for the consumer. A collective analysis shows how consumerism creates new relationships between the state and civil society.

SOURCE *AU NOM DU CONSOMMATEUR*

Alain Chatriot, Marie-Emmanuelle Chessel, Matthew Hilton / publisher: La Découverte / coll. « L'espace de l'histoire » / 423 p.

DATE JANUARY 2005

>
HYPERMODERN FOOD

Pursuing his work on hypermodern society, François Ascher analyzed the evolution of eating habits. He has made a number of hypotheses concerning the relation between sociability and feeding methods, and the emergence of a new social group for whom food is a question of daily esthetics.

SOURCE *LE MANGEUR HYPERMODERNE*

François Ascher / publisher: Odile Jacob / 300 p.

DATE MAY 2005

>
SAME-SEX PARENTING TODAY

Some thirty researchers from various countries and fields have focused on same-sex parenting and have carried out one of the most in-depth studies on the subject. The key questions: can we accept co-parenting? Is the 'one mother, one father' principle still appropriate for contemporary families?

SOURCE *HOMOPARENTALITÉS, ÉTAT DES LIEUX*

Martine Gross / publisher: Erès / coll. « La vie de l'enfant » / 448 p.

DATE FEBRUARY 2005

>
OUR CHILDREN'S EDUCATION

Educational spending in France represents 6 or 7% of the nation's income. Research scientists have analyzed the educational system, the behavior of young people and families, and have demonstrated the effect of education on the economy and on society in both rich and developing countries.

SOURCE *ÉCONOMIE DE L'ÉDUCATION*

Marc Gurgand / publisher: La Découverte / coll. « Repères » / n° 409 / 128 p.

DATE FEBRUARY 2005

IN SOCIETY

THE COMPLEXITY OF THE WESTERN WORLD, THE RICHNESS OF TRADITIONAL CULTURES: EVERY YEAR, ETHNOLOGISTS, SOCIOLOGISTS, PSYCHOLOGISTS, LINGUISTS, ECONOMISTS, AND PHILOSOPHERS PUBLISH FASCINATING RESEARCH. THEY HELP US UNDERSTAND MAN AND THE SOCIETY HE SHAPES.

RIDDLES, STRING GAMES, AND MATHEMATICS

India, Papua New Guinea, the Arctic regions: these are the destinations of research scientists involved in the *Anthropology and Mathematics* project. Their topic: the pastimes of traditional communities. They observe how people memorize games such as string games, and show how they are genuine mathematical activities. It is also a matter of reasserting the value of a threatened cultural heritage.

SOURCE *LE JOURNAL DU CNRS*

DATE JUNE 2005

A CLOSE LOOK AT SOCIAL MOVEMENTS

From trade unionism to anti-Semitism, from alter-globalization to terrorism: all social movements interest CADIS, a CNRS/EHESS laboratory that recently celebrated its 25th anniversary. Partisans of the sociological intervention method, the research scientists led the protagonists of each movement to self-analysis through meetings with various contacts, partners, or adversaries. CADIS strives to fulfill its role as a stakeholder in the major issues concerning the city.

SOURCE *LE JOURNAL DU CNRS*

DATE MAY 2005

PEOPLE OF THE KALAHARI

Bushmen are not people from beyond History who have always reproduced the same gestures and rituals. So concludes a study by two research scientists who met the bushmen. They went beyond the clichés to demonstrate that bushmen have always been our contemporaries through their art, their rituals, and their stories.

SOURCE *LES BUSHMEN DANS L'HISTOIRE*

Emmanuelle Olivier, Manuel Valentin (dir.) / CNRS éditions / 280 p.

DATE JUNE 2005

IF YOUNG PEOPLE ONLY KNEW !

'Les jeunes Européens et leurs valeurs': this is the title of a collective work on young Europeans and their values written by several sociologists. Work, sociability, politics, religion, the family: all these issues were closely examined in young people between the ages of 18 and 29. The results are clear: there is a rise in an individualism synonymous with moral egotism. Young people feel less concerned than their elders by the need to improve living conditions of the disadvantaged, while ecological values and libertarian ideology have fallen sharply. It appears that today's youth is no longer an anti-establishment force battling society and its institutions.

SOURCE *LES JEUNES EUROPÉENS ET LEURS VALEURS*

Olivier Galland et Bernard Roudet / publisher: La Découverte / coll. « Recherches » / 300 p.

DATE MAY 2005

FRENCH HUMANITIES AND SOCIAL SCIENCES LEAD EUROPE

With three networks of excellence (Prime, Ramses² and Recwowe) and two projects under French management, France plays a leading role in the European network of excellence program set up by the sixth framework program for technological research and development, followed by Great Britain and Germany. Prime (Policies for Research and Innovation in the Move towards the European Research Area) covers the analysis of research and innovation policies, Ramses² concerns Mediterranean studies, while Recwowe (Reconciling Work and Welfare in Europe) analyzes tensions in the labor market, examines both employment and social welfare programs in Europe, and studies possible solutions.

WHEN HINDUISM MEETS THE WEST

The penetration of Neo-Hindu movements has often been seen as an example of 'easternizing' the West. A sociologist has shown how, when those movements spread, they are westernized and adapt their religious traditions to their new followers. She also considered the careers of these disciples fascinated by oriental wisdom.

SOURCE *LE NOUVEL HINDOUISME OCCIDENTAL*
Véronique Altglas / CNRS éditions / coll. « CNRS sociologie » / 256 p.
DATE OCTOBER 2005

A LOOK AT THE SERVICE-BASED SOCIETY

This has become a key subject at a time when European Commission directives raise fears of social dumping. A sociologist has studied the various types of service relationships within private companies, public services, and associations. He suggests we maintain services based on solidarity.

SOURCE *SOCIOLOGIE DES SERVICES*
Jean-Louis Laville / éd. Érès / coll. « Sociétés en changement » / 180 p.
DATE MARCH 2005

MEMORY OVER THE CENTURIES

Highlights of the modern study of memory are the theme of a book written by some twenty specialists. It covers three major issues: the numerous pathologies of forgetfulness, the role of the implicit and the unconscious in creating recollections, and the search for the biological mechanisms of memory.

SOURCE *HISTOIRE DE LA MÉMOIRE*
Pathologie, psychologie et biologie / Jean-Claude Dupont (dir.) / publisher: Vuibert / 336 p.
DATE SEPTEMBER 2005

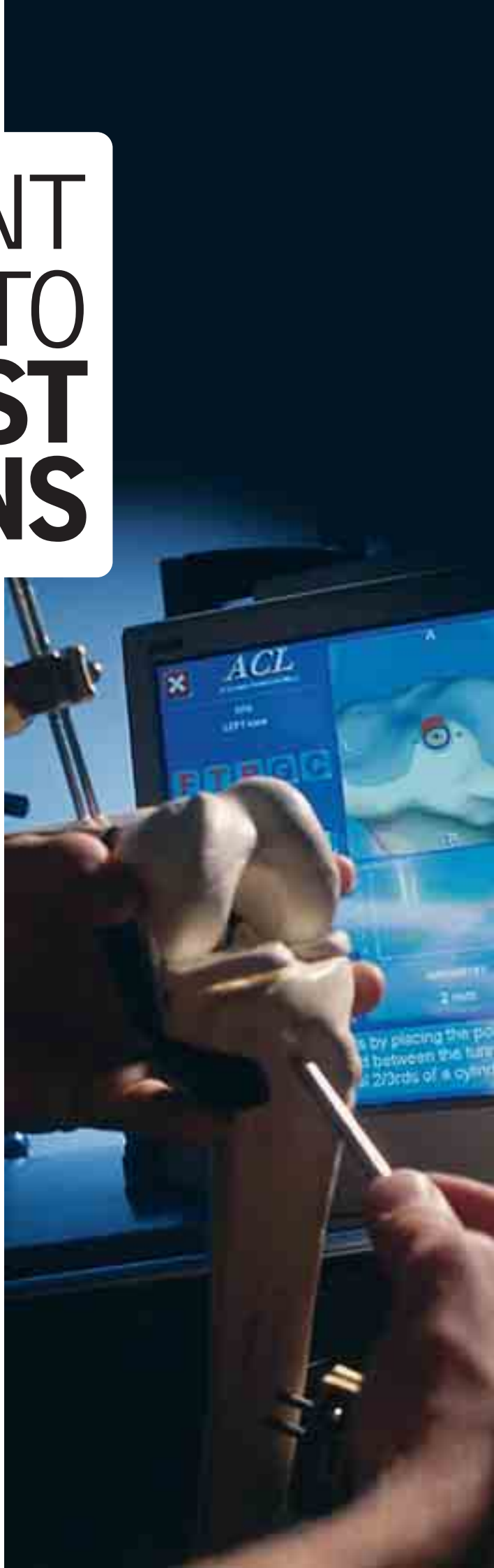
MORALITY, WAR, AND TERROR

Does morality have a role to play in international relations? A philosopher who studied war, terrorism, and our means of action says it is so and suggests we revise the ideal of a peaceful community based on universal rights and the equality of states.

SOURCE *LE BIEN, LA GUERRE ET LA TERREUR*
Monique Canto-Sperber / publisher: Plon / 359 p.
DATE FEBRUARY 2005

INTELLIGENT SYSTEMS TO **ASSIST HUMANS**

BETTER INTERNET CONNECTIONS TO IMPROVE THE DAILY LIFE OF PEOPLE WITH DISABILITIES; LARGE COMPUTER NETWORKS TO HELP SURGEONS AS THEY OPERATE. RESEARCH ON LEADING-EDGE TECHNOLOGIES FOCUS ON HUMAN NEEDS.



> PROGRESS WITH WI-FI

Finding a more efficient method for sharing access to a local area network: this is the challenge taken up by research scientists at the *Logiciels, systèmes et réseaux* (Software, Systems, and Networks) laboratory. They have developed the Idle Sense method which optimizes data throughput rates and improves network equity. Transmissions between computers are limited to one at a time. Idle Sense measures the silence time between transmissions and thereby determines how to optimally space transmission attempts so as to minimize interference.

SOURCE PRESS RELEASE
DATE OCTOBER 7, 2005

> A CAR THAT KNOWS THE WAY HOME

CNRS researchers have designed a car that can retrace a route it has already taken. The Cybercar films the trip that it will have to repeat on its own, then its onboard computer draws up a map of the landmarks that will guide it on the homeward journey.

SOURCE *LE JOURNAL DU CNRS*
DATE JUNE 2005

THE IN2P3 COMPUTING CENTER SWITCHES INTO HIGH GEAR

The computing center of the IN2P3 (National Institute of Nuclear and Particle Physics) has doubled its power with the acquisition of 320 NEC Express 5800 servers. IN2P3 is now the fifth largest computing center in the EGEE (Enabling grids for e-science in Europe) project, out of the ninety centers included in this large European infrastructure. The servers at the IN2P3 center run non-commercial applications involving high performance scientific calculations.

SOURCE NOUVELLES SCIENTIFIQUES DE L'IN2P3

DATE MARCH 14, 2005

> REWARDING KNEES

The European Commission's 2005 Information Society Technologies Prize was awarded to Praxim. This company, stemming from the *Laboratoire des Technologies de l'imagerie de la modélisation et de la cognition* (Laboratory for imaging and cognitive modeling techniques), was rewarded for its new knee surgery software. Surgeons now have an invaluable assistant for fitting knee prostheses and repairing the anterior cruciate ligament. A very important honor for this innovative company founded ten years ago that has developed 27 IT tools for medical use.

SOURCE *LE JOURNAL DU CNRS*

DATE JULY-AUGUST 2005

> FRANCE: YESTERDAY AND TODAY

Research scientists at the *Laboratoire de démographie historique* (History Research Center) have created a Web site illustrating how France's borders have changed over two centuries. Based on Cassini's map of France drawn in the 18th century and modern maps from IGN (the French *Institut Géographique National*), the site lets you switch centuries at the click of a mouse. This project appeals to historians puzzling over names of places that no longer exist, as well as to the Ministry of Equipment which can use it to refine development strategies. Furthermore, research scientists have created a database on the evolution of names, territories, and local populations.

SOURCE *LE JOURNAL DU CNRS*

DATE MAY 2005

http://cassini.ehess.fr

> AN ARTIFICIAL MICROSWIMMER

With its huge head and long tail, the first artificial microswimmer ever built resembles a spermatozoon. It is made up of a red blood cell and a magnetic filament that propels it by undulating when placed in an alternating magnetic field.

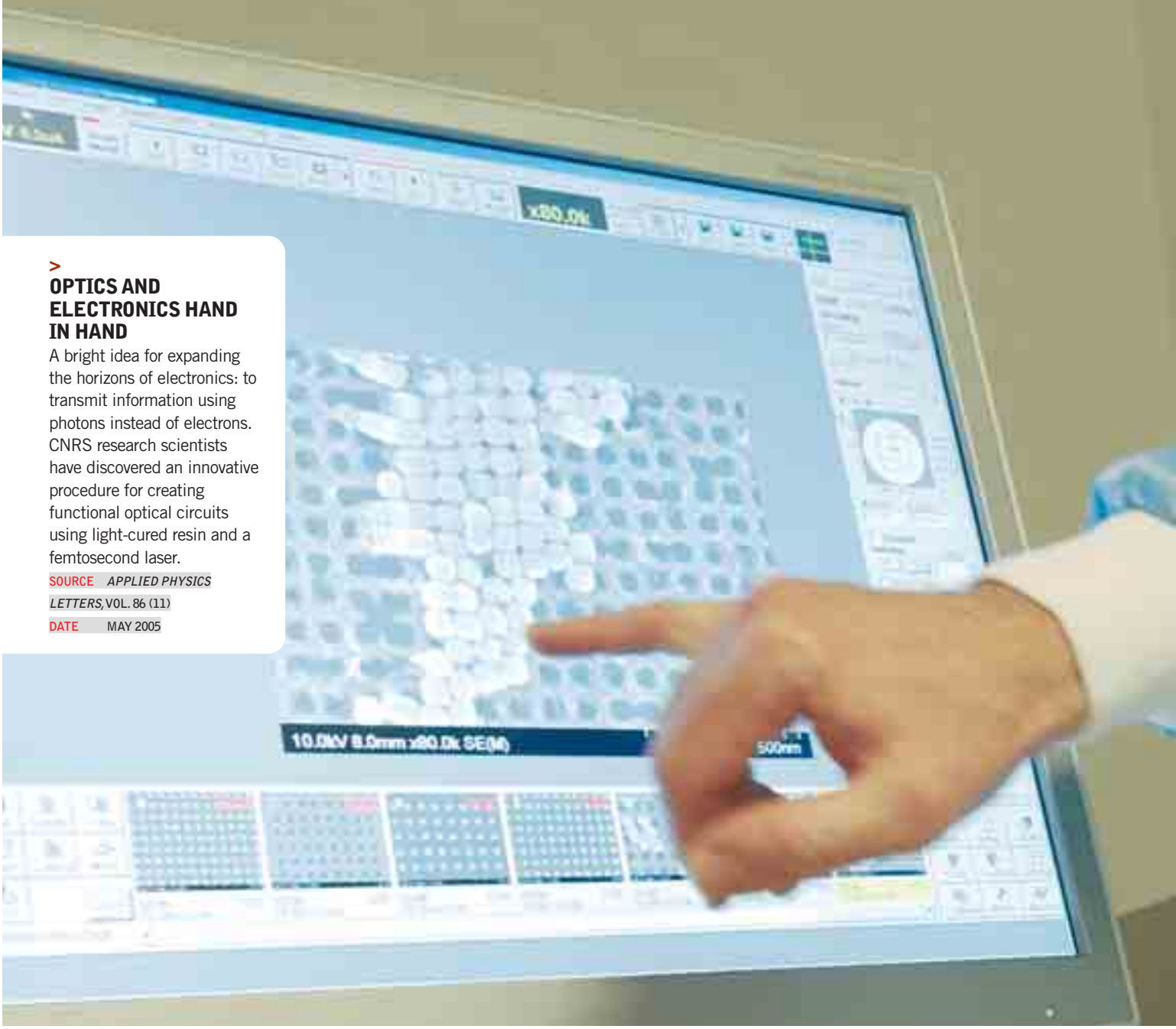
The microswimmer could be used to transport and to position cells.

SOURCE *NATURE*, VOL. 437 (7060)

DATE OCTOBER 6, 2005

THE 'NANO' CHALLENGE

ELECTRONICS, OPTICS, EQUIPMENT... SEVERAL MAJOR FIELDS OF SCIENCE HAVE CLEARLY ENTERED THE 'NANO' ERA. RESEARCHERS ARE BETTING THAT BY EXPLORING THESE NANO-WORLDS THEY WILL BE ABLE TO CONTINUALLY PUSH BACK THE LIMITS OF THE INFINITELY SMALL FOR AN INFINITE NUMBER OF APPLICATIONS.



>
OPTICS AND ELECTRONICS HAND IN HAND

A bright idea for expanding the horizons of electronics: to transmit information using photons instead of electrons. CNRS research scientists have discovered an innovative procedure for creating functional optical circuits using light-cured resin and a femtosecond laser.

SOURCE *APPLIED PHYSICS LETTERS*, VOL. 86 (11)

DATE MAY 2005

THE NANOELECTRONICS REVOLUTION IS ON THE MARCH

Electronics is now measured with a nanometer. A French-Swiss team proved it once more by developing networks of nanostructures with unrivalled properties: they can store four thousand billion bits per square centimeter, two hundred times more than current hard disks. To obtain these spectacular results, research scientists placed blocks of cobalt evenly across crystalline gold surfaces. The magnetic properties of this network would make it possible to store one bit per cobalt grain, while current technology requires four thousand grains. Only one problem remains: at present the information must be stored at a temperature of –230 °C.

SOURCE *PHYSICAL REVIEW LETTERS*, VOL. 95
DATE OCTOBER 7, 2005

MINIATURE RELAY ANTENNAS

Do cell phone relay antennas take up too much space? Then let's shrink them to one-tenth of their current size! To make this breakthrough possible, a team of research scientists is working on the first applications of 'photonic crystals'. This is a material containing regular patterns which makes it possible to reflect certain wavelengths. Researchers integrated certain electronics components in the crystals, and produced the prototype of an intelligent antenna that transmits in a specific direction, which can be changed in less than a microsecond. This achievement resulted in three patents.

SOURCE *PHOTONIC CRYSTALS Towards Nanoscale Photonic Devices* / Jean-Michel Lourtioz and al. / Springer Verlag / 430 p.
DATE 2005

OPENING UP NANOPORES

Research scientists at the Institut Lavoisier have developed a nanoporous compound with unique capabilities. This is a strategic material in the energy field because of its adsorbant properties (adhesion and attachment to the surface), in particular for applications such as storing either hydrogen for fuel cells or CO_2. The chromium terephthalate produced by the researchers has 2.9 and 3.4 nanometer pores and an adsorbant surface of 6,000 sq. meters/g. A record! This is the best known nanomaterial for storing hydrogen, and it can also store large molecules and drugs.

SOURCE *SCIENCE*, VOL. 309 (5743)
DATE SEPTEMBER 23, 2005

DROPLETS ON CARBON NANOTUBES

Research scientists have made a discovery that brings into question the entire formation mechanism for carbon nanotubes, a material with promising industrial potential. Researchers found that small beads of carbon form on the nanotubes, seeming to indicate that nanotubes are not made from carbon vapor but from liquid carbon.

SOURCE *LE JOURNAL DU CNRS*
DATE MAY 2005

CNRS IN THE LAND OF MORNING CALM

Two cooperative agreements were signed in March with the Korean Ministry of Science and Technology. A memorandum of understanding links CNRS and the Korea Institute of Science and Technology (KIST). It will enable the creation of a joint international laboratory in nanophotonics. The Institut Pasteur Korea will facilitate the hosting of CNRS researchers in Asian countries.

SOURCE *LE JOURNAL DU CNRS*
DATE MAY 2005

>
SEEING THE INFRARED

Cameras that can see at night, in fog, or inside the body? This may be possible thanks to the new type of infrared sensor designed by researchers at CNRS and Thales. Electrons move along the sensor's semiconducting nanolayers when infrared photons provide them with energy.

SOURCE *APPLIED PHYSICS LETTERS*

DATE APRIL 2005

>
PROGRESS THROUGH AGITATION

CNRS research scientists have demonstrated that RNA polymerase, a protein involved in transcription, uses thermal agitation to move along DNA strands. This nanomotor model moves at about 100 nucleotides per second, propelled by random collisions with molecules in the same solution.

SOURCE *PHYSICAL REVIEW LETTERS*

DATE APRIL 2005

A CALCULATOR MOLECULE

Picoelectronics, the future descendant of nanoelectronics, is a go! The goal of the European Pico-inside project is to use a single molecule to perform complex mathematical operations, by encoding binary information in the molecule. In this context, CNRS is working with twelve other institutes and two companies to explore the ultimate limits of computers.

SOURCE PRESS RELEASE

DATE DECEMBER 5, 2005

>
A WELL-CONTROLLED MOLECULAR MACHINE

To steer the movements of an individual molecule: research scientists at the CNRS Photophysics Laboratory in Orsay, France achieved this feat using a metallic point to excite chosen spots on a biphenyl molecule with accuracy on the order of 10 picometers. Scientists are now able to turn it into a molecular machine whose actions they can select. These results make it possible to imagine machines able to explore a living cell or used as miniscule physical sensors.

SOURCE *SCIENCE*, VOL. 308 (7047)

DATE MAY 13, 2005

BIRTH ANNOUNCEMENT

Good news: thanks to the restructuring of five physics labs, Jussieu now has two new institutes dedicated to condensed matter. The *Institut des nanosciences de Paris* (INSP—Paris Nanosciences Institute) will work on physical phenomena in very small objects. The *Institut de minéralogie et de physique des milieux condensés* (IMPMC—Institute of Mineralogy and Physics of Condensed Matter) includes four departments: materials, physics of condensed media, mineralogy, and structural biology.

SOURCE *LE JOURNAL DU CNRS*

DATE MARCH 2005

THE LATEST IN ELECTRONICS

CRYSTALS AND MOLECULES ARE THE PREFERRED BUILDING BLOCKS OF RESEARCH SCIENTISTS DEVELOPING THE BASIC ELECTRONICS FOR TOMORROW'S COMPUTERS.

> DIAMONDS: ELECTRONIC JEWELS?

In theory, diamonds are the fastest and most resistant of semiconductors. They seem an ideal substitute for silicon in electronics. But in practice, scientists continue to have problems controlling their conductivity. Research scientists at the Solid-State Physics and Cristallogenesis Laboratory are working on a promising lead to overcome this difficulty. They have discovered a process for producing diamonds with conductivity 10,000 times greater than with traditional methods. They still need to better control the process before considering industrial applications for these precious stones.

SOURCE *LE JOURNAL DU CNRS*
DATE SEPTEMBER 2005

> TOWARDS THE COMPUTER OF THE FUTURE

Faster reading and writing of information: this is the major challenge for computers of the future. A French-Japanese team has managed to change a molecular crystal from an insulating state to a metallic state in just 2 picoseconds using a flash laser. This is a 1,000 times faster than current rates.

SOURCE *SCIENCE*, VOL. 307 (5706)
DATE JANUARY 7, 2005

> MOLECULES FOR STORING INFORMATION

CNRS research scientists have demonstrated the possibility of writing and erasing information in molecular materials at room temperature. Using a laser, they changed the spin status of a chemical compound from low to high, which would make it possible to reversibly encode data in binary format. Onwards to a new era in electronics !

SOURCE *PHYSICAL REVIEW LETTERS*, VOL. 94 (10)
DATE MARCH 12, 2005

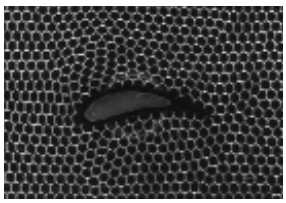
MATTER REVEALED

FROM FUNDAMENTAL PARTICLES TO THE STRANGE STATES OF MATTER, THERE HAVE BEEN NUMEROUS DISCOVERIES ON THE LONG ROAD TO UNDERSTANDING THE BASIC STRUCTURE OF MATTER AND TO THE DEVELOPMENT OF NEW MATERIALS.

> FLYING IN FOAM

Could an aircraft fly in foam? No, according to research scientists who have demonstrated the properties of how foam flows around an obstacle shaped like an airplane wing. This research helps scientists understand the behavior of many materials, from biological cells to pasty or granular materials.

SOURCE *PHYSICAL REVIEW LETTERS*, VOL. 95 (17)
DATE OCTOBER 14, 2005



> PROCESSING MOUNTAINS OF DATA

The equivalent of 3,000 Pentium III processors: that is the computing power that will be unleashed by networking several computing centers — including the IN2P3/CNRS center — in six countries. The goal? To process the enormous mass of experimental data (250 terabytes) resulting from the D0 experiment on the collisions of protons and antiprotons. Physicists will finally be able to make optimal use of this information.

SOURCE NOUVELLE SCIENTIFIQUE DE L'IN2P3
DATE MAY 2, 2005

> A PUMPKIN-SHAPED ATOM

Flattened like a pumpkin: that is the shape of an excited atomic nucleus observed by physicists at the GANIL (*Grand accélérateur national d'ions lourds* - National Heavy Ion Accelerator) in Caen. For the first time, researchers have managed to measure the deformation of one of these exotic, short-lived nuclei (iron 61 to be precise) produced by the fragmentation of a beam of stable nuclei.

SOURCE IN2P3 PRESS RELEASE
DATE SEPTEMBER 1, 2005

METALLIC ALLOYS COUNTER-ATTACK

***Complex Metallic Alloys*: is a new European network of excellence coordinated by CNRS. Three hundred and thirty research scientists and PhD students will explore the world of complex metallic alloys. These new materials, alloys of several components, have neither been studied in depth nor leveraged. Yet their unusual properties offer extensive possibilities for innovation, especially in health care, telecommunications, energy, and tooling.**

SOURCE PRESS RELEASE
DATE OCTOBER 24, 2005

> MYSTERIOUS DROPS

What is round at one end and pointed at the other? A drop moving along an inclined surface. For the first time, research scientists have explained why it has that shape. Now we better understand how liquids flow — an area of great interest to industry.

SOURCE *PHYSICAL REVIEW LETTERS*, VOL. 94 (2)
DATE JANUARY 21, 2005

> RUBIES AND SAPPHIRES REVEAL THEIR ORIGINS

Research scientists have created a database of ruby and sapphire isotopes from around the world. This task, which took four years to complete, will make it possible to go back to the original deposits of these precious stones and should also help prospectors find new ones.

SOURCE *GEOLOGY*, VOL. 33 (4)
DATE APRIL 2005

BABAR DISCOVERS A NEW PARTICLE

Y(4260) is the nickname of the latest particle discovered by an international team including CNRS/IN2P3 (National Institute of Nuclear and Particle Physics) laboratories. The particle was discovered thanks to BaBar, an experiment run at the Stanford Linear Accelerator. Created by collisions between electrons and positons, this massive particle has properties that challenge our understanding of matter. A member of the charmonium family of mesons, it is comprised of a quark-antiquark pair. But its enormous mass and its quantum numbers present serious theoretical problems. Y(4260) is yet another of those exotic particles discovered over the past few years, especially by BaBar.

SOURCE *PHYSICAL REVIEW LETTERS*, VOL. 95 (14)
DATE SEPTEMBER 30, 2005

ION BEAMS AT YOUR SERVICE

Making ion beams available to research scientists and to industry: this is the objective of the AIFIRA platform inaugurated by two laboratories in the Aquitaine region in southwestern France. The low-energy ion accelerator at AIFIRA will facilitate the study of the environment, health, new materials, etc. Manufacturers who would like to set up links with scientists and benefit from this equipment should take note.

SOURCE PRESS RELEASE
DATE OCTOBER 11, 2005

CREATING A GREENER WORLD

ECOLOGICAL AIRCRAFT, ORGANIC HOMES, CLEAN CHEMICALS... RESEARCH IS STRIVING TO MAKE TOMORROW'S MATERIALS MORE ECOLOGICAL IN ORDER TO LAY THE FOUNDATIONS FOR SUSTAINABLE DEVELOPMENT.

>
KEEPING WOOD ORGANIC

Research scientists have developed an industrial process to prevent wood from expanding with humidity. This thermal method, called *Rétification* (burnishing), does not use any chemical pollutants. The process removes one of the few drawbacks of this inexpensive, attractive, resistant and biodegradable product.

SOURCE *LE JOURNAL DU CNRS*
DATE JUNE 2005

EUROPEAN BOOST TO CHEMISTRY

Inventing the chemical industry of tomorrow: that is the goal of Impulse, a European Commission project coordinated by CNRS. The idea is to foster the development of microtechnologies in the chemical industry. Miniaturizing production lines would make it possible to manufacture products with controlled purity at a reasonable price, while taking into account both safety and environmental constraints.

SOURCE *LE JOURNAL DU CNRS*
DATE OCTOBER 2005

TOPCOMBI CATALYZES CHEMISTRY

To discover new catalysts, why not use combinatorial chemistry, i.e. the automated synthesis of a large number of molecules? That is the idea behind *Topcombi*, a European program involving 22 partners and coordinated by the CNRS *Institut de recherches sur la catalyse* (Catalysis Research Center). Thanks to new catalysts, scientists hope to discover more environmental-friendly synthesis methods.

SOURCE *LE JOURNAL DU CNRS*
DATE APRIL 2005

> PIPING DOWN SCALE DEPOSITS

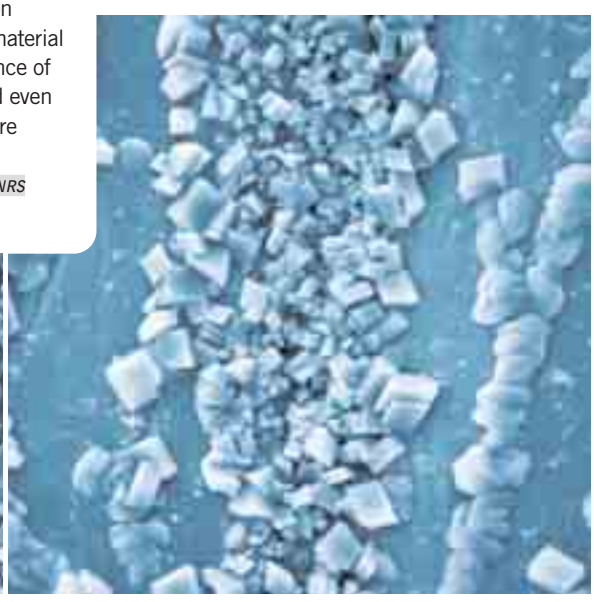
Scale deposits block pipes, foster the growth of bacteria, and can accumulate in such large quantities that their weight jeopardizes the structure of buildings. Currently there are few techniques for fighting it. The *Laboratoire de microstructure et mécanique des matériaux* (LM3—Microstructure and Mechanics of Materials Laboratory) addressed this problem with a method for classifying water according to its 'scaling' capabilities. Researchers discovered unsuspected factors that encourage the formation of this limestone: the material of the pipes, the presence of algae and bacteria, and even the water's history before it entered the pipes.

SOURCE *LE JOURNAL DU CNRS*
DATE MARCH 2005

> TALCUM POWDER FOR AIRPLANES

What is non-polluting, makes skin soft, resists extreme conditions, and will be a component in the material used to coat the metallic parts used in aircraft? The answer: talcum powder. Research scientists in Toulouse and the Limousin region have patented a new type of coating that uses both the extraordinary lubricating properties of this natural magnesium silicate and its resistance to high temperatures and oxidizing environments. Winner of the first prize in the Midi-Pyrenees Innovation Contest, this talcum powder formula will replace chromium and cadmium (polluting agents) in coating aircraft fastenings. It should make for softer landings.

SOURCE *LE JOURNAL DU CNRS*
DATE FEBRUARY 2005



ECOSYSTEMS IN DANGER

ALL INDICATORS POINT TO THE SAME CONCLUSION: THE CLIMATE IS CHANGING. AND SCIENTIFIC INVOLVEMENT IS INTENSE, BECAUSE IT IS URGENT TO DETERMINE THE REAL EXTENT OF GLOBAL WARMING AND ITS EFFECTS ON ECOSYSTEMS.

GLOBAL WARMING CONFIRMED

Between 1.5 and 4°C: that is the amount of global warming anticipated before the year 2100 by two French digital simulation models. These results were obtained as part of a report by the 'Intergovernmental Panel on Climate Change'. Climatologists analyzed various scenarios of greenhouse gas and sulfate aerosol emissions over the course of the 21st century.

SOURCE DOSSIER DE PRESSE CNRS / CEA / MÉTÉO FRANCE
DATE JULY-AUGUST 2005

THE FURIOUS FIFTIES OF RESEARCH

Off we go to the Antarctic Ocean on board the Marion Dufresne. The Keops oceanographic mission involves fifty research scientists who observed the spring outburst of plankton. Scientists want to understand the distribution of iron in the region and its role in the development of microalgae, whose biological activity has a major impact on the world's climate.

SOURCE *LE JOURNAL DU CNRS*
DATE JANUARY 2005

MELTING GLACIERS IN THE ALPS

The extensive shrinkage of Alpine glaciers over the last 150 years appears to have started with a reduction in winter snowfall. This is the conclusion of research scientists at the Laboratory of Glaciology and Environmental Geophysics in Grenoble, who studied variations in the volume of several glaciers using old maps and ice flow models. The glaciers began to shrink around 1830 when temperatures were not especially high. On the other hand, winter precipitation had dropped by 25%. Summer warming, the other cause of melting ice, only appeared in the early 20th century, and particularly since 1980.

SOURCE *GEOPHYSICAL RESEARCH LETTERS*, VOL. 32
DATE MAY 24, 2005

RESEARCHERS MOBILIZED TO STUDY MONSOONS

Over sixty European, American, and African laboratories will take part in the *AMMA* program (*analyse multidisciplinaire de la mousson africaine* —African Monsoon Multidisciplinary Analysis) initiated by French research scientists. It is a large project that will improve our knowledge of the variability of this rainy season, as well as its impact on health, plant resources, and water resources. AMMA will also help improve global weather models.

HOT AND COLD SPELLS IN ICE

The most recent glacial period was marked by hot and cold spells lasting a few dozen years. Research scientists at the *Laboratoire des sciences du climat et de l'environnement* (Climatic and Environmental Sciences Laboratory), in collaboration with teams from several countries, have demonstrated that these abrupt temperature changes may have reached up to 16°C locally! The scientists also showed a correlation between these phenomena and a seasonal reorganization of atmospheric circulation and of the water cycle. Climate models should incorporate these results in order to estimate the risks of similar catastrophic variations in future climate changes.

SOURCE *SCIENCE*, VOL. 309(5731)
DATE JULY 1, 2005

BLIZZARDS AND ICE CORE SAMPLES

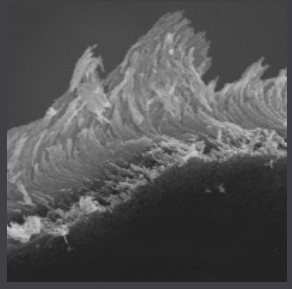
The new European Project for Ice Coring in Antarctica (EPICA) includes ten European countries; several CNRS laboratories are taking part. Their aim is to drill a core in the glacier at two diametrically opposite sites of the Antarctic. Thus 740,000 years of climate history will be revealed, making it possible to more accurately track the relationship between atmospheric chemistry and climate change.

SOURCE *SCIENCE*, VOL. 310 (5752)
DATE NOVEMBER 25, 2005

THE OCEAN WILL BECOME AN ACID BATH

Within 50 to 100 years, some organisms will dissolve in the sea because it will have become too acidic for them. This has been demonstrated by an international team of oceanographers using thirteen different digital models. The ocean absorbs a large part of the CO_2 in the atmosphere, and rising CO_2 levels are making the ocean more acidic. It will become corrosive for certain forms of limestone found in the shells of species such as the pteropod, a planktonic mollusk. Coral will also be threatened. The disappearance of these animals will have consequences throughout the food chain and on animals living on barrier reefs.

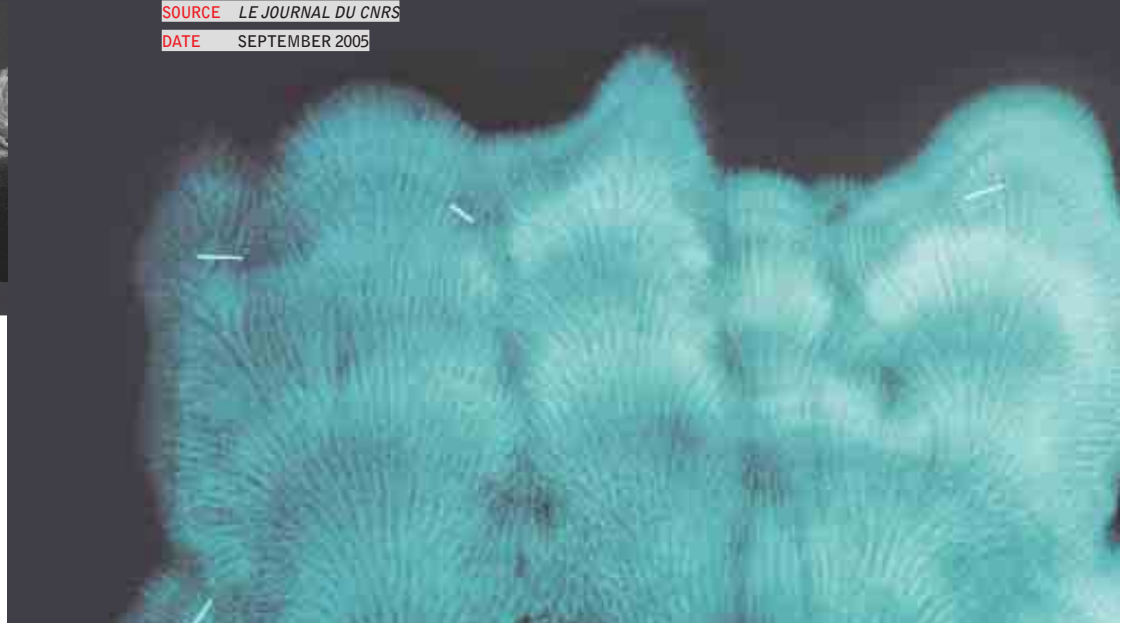
SOURCE *NATURE*, VOL.437 (7059)
DATE SEPTEMBER 29, 2005



UNDER THE BARRIER REEF

A dream mission for oceanographers. The *Tahiti Sea Level* exhibition, part of the international *Integrated Ocean Drilling Program*, probed the Tahitian barrier reef using a drilling vessel. The goal of the most ambitious drilling campaign ever attempted in a reef was to measure the fluctuation of the sea level and the climate's variability over 23,000 years, and to understand how coral has coped with these changes.

SOURCE *LE JOURNAL DU CNRS*
DATE SEPTEMBER 2005



PROTECTING THE EN

SAFEGUARDING THE ENVIRONMENT, ENSURING THE SURVIVAL OF ALL SPECIES... LABORATORY SCIENTISTS ARE UNITING TO OBSERVE MAN'S ACTIONS ON BIODIVERSITY, WATER RESOURCES AND AIR QUALITY, IN ORDER TO PRESERVE THE FUTURE.

>
ECOLOGICAL HAVOC WREAKED BY THE HEATWAVE

During the 2003 drought, Europe went through an historical reduction in plant activity. So concluded a team which, for the first time, demonstrated that extreme heat and drought can alter the carbon cycle by abnormally increasing CO_2 emissions in the atmosphere.

SOURCE *NATURE*, VOL. 437 (7058)
DATE SEPTEMBER 22, 2005

>
PRESERVING THE MILDNESS OF A TROPICAL GULF

There is only one way to preserve the tropical coasts of Latin America: by raising the awareness of the local population. This is the goal of the laboratories taking part in the multidisciplinary program for *Gestion intégrée des aires côtières tropicales* (Integrated Management of Tropical Coastal Areas). In order to protect the Golfo Dulce in Costa Rica, research scientists have carried out investigations and organized workshops to get the local inhabitants involved in preserving their natural heritage.

SOURCE *LE JOURNAL DU CNRS*
DATE JULY-AUGUST 2005

>
THREATS TO THE EUROPEAN ENVIRONMENT

Some European regions will become more vulnerable over the 21st century. That is the result of modeling carried out by European laboratories. Research scientists predict a decline in biodiversity, soil fertility, and water resources, especially in the Mediterranean region.

SOURCE *SCIENCE ONLINE*
DATE OCTOBER 27, 2005

>
WATER: COASTAL RESOURCES IN DANGER

Intensive pumping of fresh water coastal reserves causes salt water to penetrate inland. Several laboratories designed the ALIANCE project in order to monitor this phenomenon. Scientists successfully tested new hydrogeophysical tools in Brittany and Majorca.

SOURCE *LE JOURNAL DU CNRS*
DATE MAY 2005

>
MIGRATION OF TRAVELING POLLEN

Pollen grains can cover several thousand kilometers via air masses sweeping across areas where plants grow. Research scientists are now able to determine the date and place of origin of grains captured in their sensors: they simply trace the path of the air masses. This research will help us better understand the climate of the past.

SOURCE *LE JOURNAL DU CNRS*
DATE JUNE 2005

VIRONMENT

THE METEOROLOGY OF AIR POLLUTANTS

Do you need information on the air quality in your area? Visit www.prevair.org. This service of the French Ministry of the Ecology and Sustainable Development, developed in partnership with CNRS, INERIS, ADEME, and Météo France, produces and distributes daily maps of pollutants in the atmosphere such as ozone, nitrogen dioxide, and particles.

SOURCE *LE JOURNAL DU CNRS*
DATE FEBRUARY 2005

CLOSELY MONITORING THE OZONE HOLE

French scientists working at the American McMurdo base in Antarctica: this is part of the Stratéole/Vorcore campaign launched by CNRS and CNES, and supported by the National Science Foundation in the United States and by the *Institut Polaire Paul-Émile Victor.* Their goal is to study the evolution of the ozone hole in the polar vortex during the winter. To do so, they have launched several pressurized balloons carrying scientific capsules.

SOURCE PRESS RELEASE
DATE AUGUST 31, 2005

AN INVENTION THAT WILL MAKE WAVES

Searev is the name of a machine that transforms wave energy into electricity. Designed in Nantes by the Laboratoire de mécanique des fluides (Fluid Mechanics Laboratory), it will give access to this inexhaustible supply of 2,500 W/sq. meter (versus 400 for eolian energy and 150 for solar energy). Research scientists are performing intense R&D work using a 1/12 scale model. The full-scale wave engine (24 by 14 meters; 1,000 tons) should provide 500 kW. We can already imagine wave engine farms off the coast made of a few dozen *Searev* units, level with the water. They would provide clean, renewable energy with no audible or visual disturbances.

SOURCE *LE JOURNAL DU CNRS*
DATE OCTOBER 2005

AND HEAT BECAME ELECTRICITY

Thermogeneration consists in transforming heat into electricity. The *Laboratoire de physique des matériaux* (Materials Physics Laboratory) in Nancy is searching for applications concerning both outer space and our homes. It should be possible to create energy by heating water in a house, or to cool a space shuttle thanks to the heat loss of its engine.

SOURCE *LE JOURNAL DU CNRS*
DATE OCTOBER 2005

ENERGY FOR **LESS POLLUT**

THE ENERGY THAT KEEPS SOCIETY ALIVE AND MOVING IS EVERYWHERE: IN AN OCEAN WAVE, IN SUNLIGHT, IN OUR FARM PRODUCE, IN THE CENTER OF THE ATOM. NATURE OFFERS CLEAN, INEXHAUSTIBLE SOURCES OF ENERGY. RESEARCH SCIENTISTS AND ENGINEERS DEMONSTRATE HOW THIS ENERGY CAN BE COLLECTED AND USED.

FRENCH-BELGIAN ATOMS

CNRS and the Centre d'étude de l'énergie nucléaire belge (SCK-CEN – the Belgian Nuclear Research Center) have signed an agreement as part of the MYRRHA project (Multi-purpose hYbrid Research Reactor for High-tech Applications). The goal of this ambitious European project is to develop a prototype, which would represent an important milestone in the transmutation of highly radioactive nuclear waste. The two organizations are contributing to safer, more efficient use of nuclear energy and its applications.

SOURCE PRESS RELEASE
DATE FEBRUARY 10, 2005

GOODBYE OIL, HELLO BIOETHANOL

Soon all vehicles will use fuel mixed with agricultural products. Research scientists at the laboratoire *Biotechnologies, bioprocédés* (Biotechnologies, Bioprocesses Laboratory) have set a new record in producing bioethanol: 40 kg/hour at 8 degrees of alcohol, for one cubic meter of fermenting must. Their yeasts work twenty times faster than those currently used in factories. The scientists' goal is to minimize the cost of biofuels by optimizing production. They are also trying to identify new sources such as wheat straw or wood. Finally, they are developing new molecules that could be added to fossil fuels in a higher proportion.

SOURCE PRESS RELEASE
DATE JULY 13, 2005

AN 'ENERGETIC' COLLABORATION

The US *Department of Energy* is enhancing its cooperation with CNRS, particularly concerning future energy sources and the environment. For five years, specialists on both sides of the Atlantic will combine forces in the fields of nuclear physics, heavy ions, particle physics, astrophysics, and cosmology.

SOURCE *LE JOURNAL DU CNRS*
DATE MAY 2005

WHEN PLANES MEND THEIR WOUNDS

A crack in an engine that repairs itself? This will soon be possible thanks to self-healing materials, ceramics able to seal a gap. This mechanism, based on oxidation, multiplies the lifetime of those materials by a factor of 100. Manufacturers are already considering potential applications, specifically in aeronautics.

SOURCE *LE JOURNAL DU CNRS*
DATE JUNE 2005

ION

ANATOMY OF THE EARTH

OUR PLANET IS ALIVE AND ALL OF IT IS ON THE MOVE: ITS TECTONIC PLATES, ITS MAGNETIC FIELD, ITS ATMOSPHERE, ETC. IN ORDER TO ANTICIPATE CHANGES AND SUDDEN JOLTS, RESEARCH SCIENTISTS ARE INVESTIGATING THE DYNAMICS AND MECHANISMS THAT DRIVE THE MACHINE CALLED EARTH.

BACKGROUND NOISE SHAKES UP SEISMOLOGY

For the first time, a map of California's subsurface was produced using the background noise recorded by an entire network of seismological stations in the Golden state. Developed by CNRS research scientists and researchers at the University of Colorado, this method made it possible to determine the areas at risk and to identify granitic bodies at a depth of 20 km. Scientists need no longer wait for an earthquake to study the subsurface.

SOURCE *SCIENCE*, VOL. 437 (5715)

DATE MARCH 11, 2005

> THE DIFFICULT RISE OF BASALT

Two research scientists have described the ascension of basalt in mid-ocean ridges. The noble gases contained in vesicles trapped in the rock indicate that magma from the earth's mantel paused several times as it rose, losing some of its gas in the process. This explains why the concentration of gas varies from sample to sample.

SOURCE *NATURE*, VOL. 436 (7047)

DATE JULY 7, 2005

> UNSTABLE SAND DUNES

Why don't the Saharan dunes grow indefinitely? A team of research scientists provided an explanation by demonstrating the fundamentally unstable nature of the barchan dunes in southern Morocco. By combining both field measurements and modeling, they have shown that this instability governs their size.

SOURCE *NATURE*, VOL. 437 (7059)

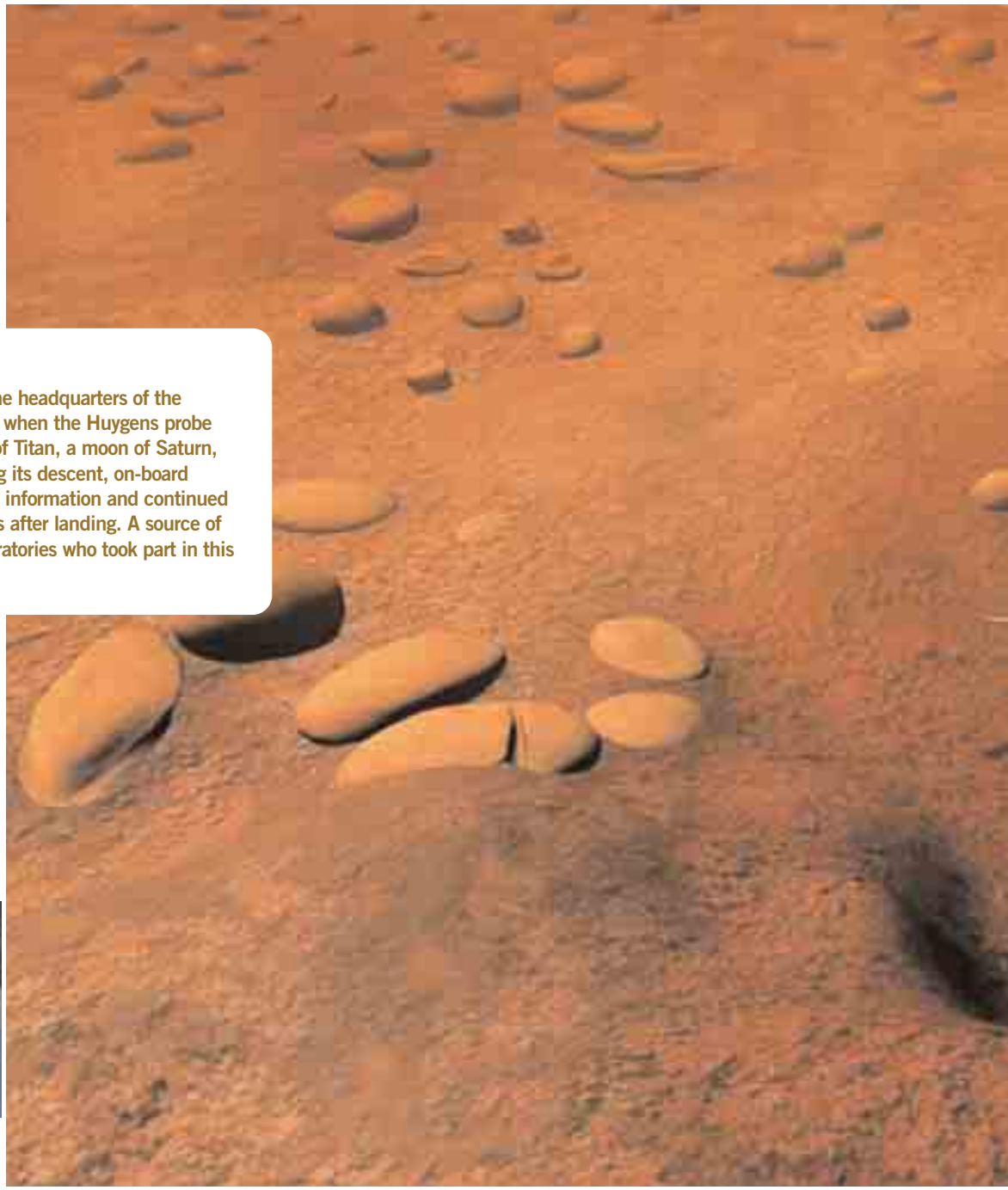
DATE SEPTEMBER 29, 2005

>

THE EARTH'S MAGNETIC FIELD: A SERIES OF REVERSALS

A team studying variations in the intensity of the earth's magnetic field over two million years has shown that the field fluctuates constantly and tends to reverse when it is weakest. These observations should help us understand why the Earth occasionally loses its bearings.

SOURCE *NATURE*, VOL. 435 (7043)
DATE JUNE 9, 2005



A VICTORY OF TITANS

Champagne corks popped at the headquarters of the European Space Agency (ESA) when the Huygens probe went through the atmosphere of Titan, a moon of Saturn, and landed undamaged. During its descent, on-board instruments collected reams of information and continued to transmit data for 90 minutes after landing. A source of pride for the CNRS space laboratories who took part in this successful mission.

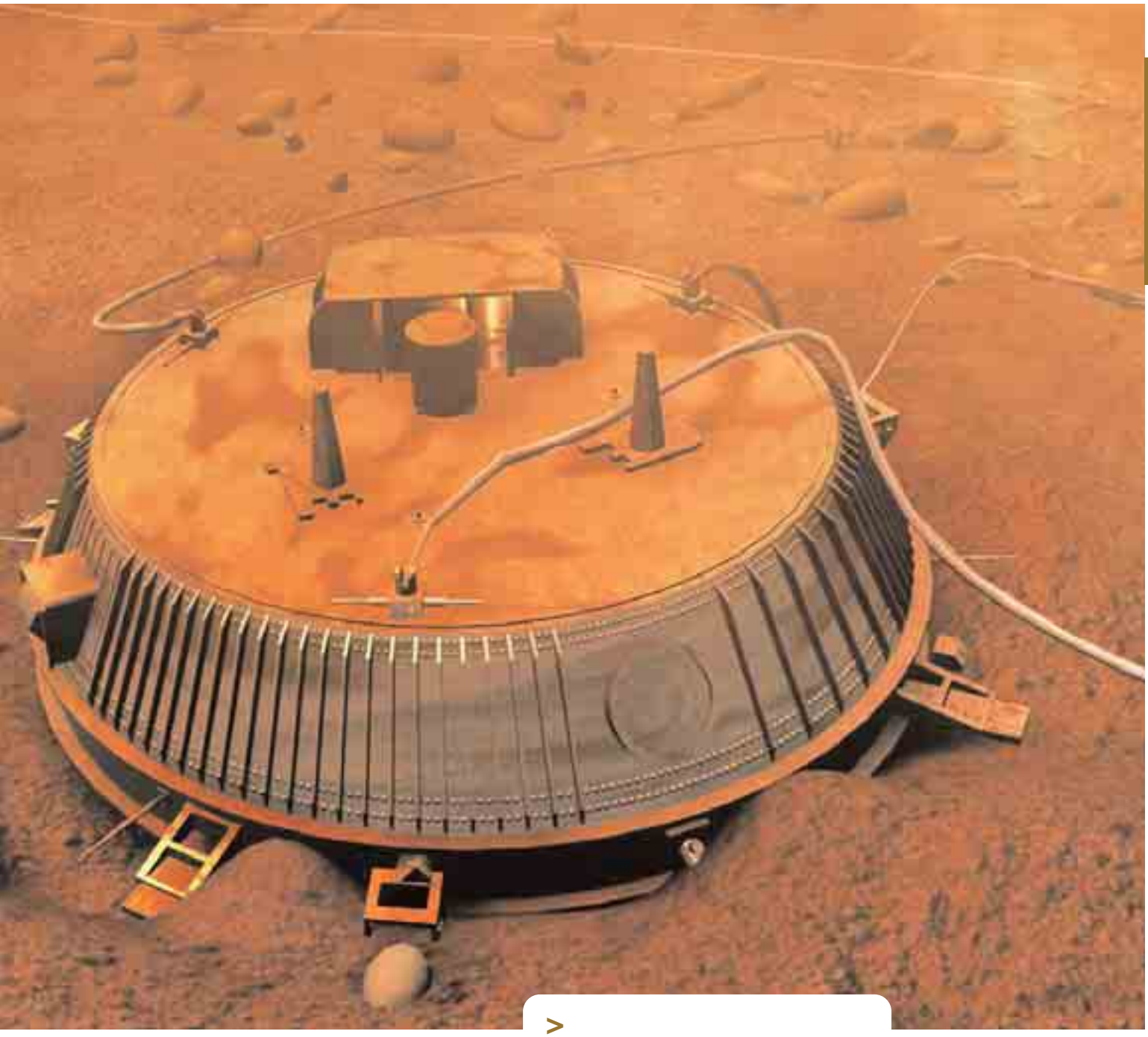
THE SOLAR SHIELD IS BENT OUT OF SHAPE

The heliosphere, the shield protecting the solar system from particles arriving from the outside, is battered. This protective cocoon which extends well beyond the orbit of Pluto is created by the wind of particles emitted by our sun. But according to CNRS researchers who have analyzed data from the Soho satellite, it is bent by the interstellar magnetic field.

SOURCE *SCIENCE*, VOL. 307 (5714)
DATE MARCH 4, 2005

TRIPPING THROUGH THE SOLAR SYSTEM

THE STARS IN OUR SOLAR SYSTEM, ARE REVEALING THEMSELVES LITTLE BY LITTLE EACH DAY AS SCIENTISTS ANALYZE HOW THEY WORK. NOW IT IS POSSIBLE FOR SPACE EXPLORATION VEHICLES TO MAKE EXCURSIONS ON SATURN'S FAMOUS MOON, TITAN.



>
A MARTIAN AURORA BOREALIS

A team of researchers was lucky enough to observe the Martian equivalent of our aurora borealis. Thanks to the Spica spectrometer on Mars Express, they have discovered an area 30 km in diameter emitting ultraviolet light and located in a region with a fossilized magnetic field.

SOURCE *NATURE*, VOL. 435 (7043)
DATE JUNE 9, 2005

>
UV LIGHTS IN THE MARTIAN NIGHT

Thanks to the Mars Express probe, CNRS research scientists have detected a surprising emission of ultraviolet light, particularly intense at the South Pole. It is due to the region's powerful winds: in winter, the atmosphere freezes on the ground, causing a strong draught. This excites the nitrogen monoxide molecules which then emit UV photons.

SOURCE *SCIENCE*, VOL. 307 (5709)
DATE JANUARY 28, 2005

>
A SPRINKLING OF COSMIC DUST

15,000 tons: that is the amount of meteorite dust that falls on the Earth every year. An international team demonstrated this by measuring the amount of iridium and platinum in a 3 km core sample of ice from Greenland. This dust fallout has remained very constant over the past 10,000 years.

SOURCE *LE JOURNAL DU CNRS*
DATE FÉVRIER 2005

>
THE BIRTH OF METEORITES

Research scientists studying the structure and composition of meteorites have determined the duration of shocks between asteroids and the planets which gave birth to them. The time it takes the asteroid to smash into a planet tells us about these phenomena and their central role in the first steps of the solar system.

SOURCE *NATURE*, VOL. 435 (7045)
DATE JUNE 23, 2005

THE SKY SEEN FROM THE EARTH

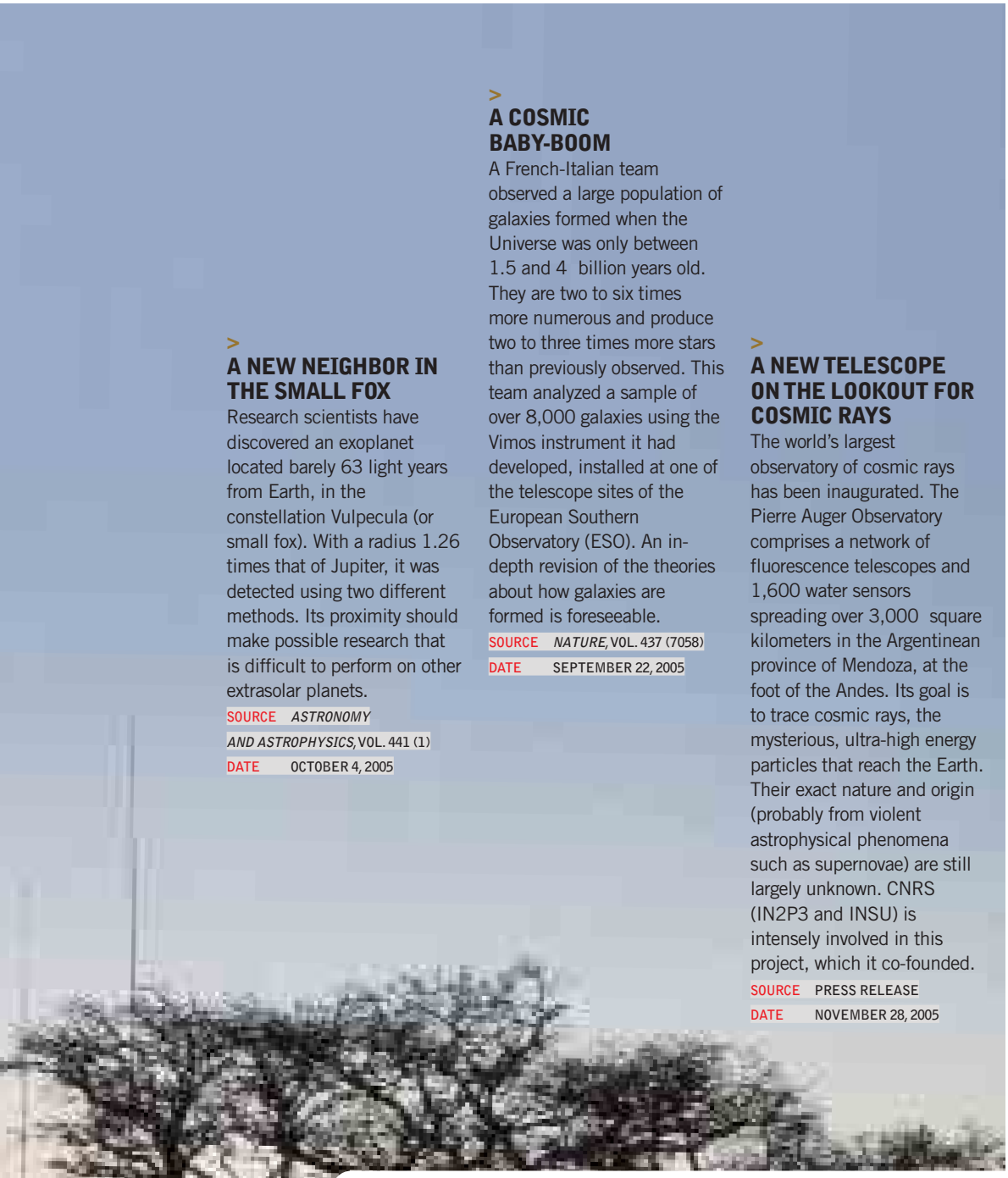
NEBULA, EXTRASOLAR PLANETS, GAMMA SOURCES AND COSMIC RAYS: ASTRONOMERS AND ASTROPHYSICISTS CAN LET US TRAVEL TO THE FAR REACHES OF THE UNIVERSE, OR SHOW US THE NEIGHBORHOOD OF OUR BLUE PLANET. THEIR INSTRUMENTS ARE IMPROVING AND ARE MORE ACCURATE EVERY DAY; THEY CONTINUOUSLY PROBE THE COSMOS TO GRADUALLY UNVEIL ITS SECRETS.

>

THE SOURCE OF GAMMA RAYS

Astrophysicists in the HESS program have discovered a new source emitting gamma photons, the most intense form of electromagnetic radiation and produced by violent phenomena such as supernovae. The new source is a dual system comprising a normal star and a massive star – a black hole or a neutron star (what is left of a massive star after the supernova stage). The star's gas is snatched away and spirals down to the compact object, casting off jets of matter which produce gamma rays. This unexpected phenomenon raises many questions for theorists.

SOURCE *SCIENCE*, VOL. 309 (5735)
DATE JULY 29, 2005



A NEW NEIGHBOR IN THE SMALL FOX

Research scientists have discovered an exoplanet located barely 63 light years from Earth, in the constellation Vulpecula (or small fox). With a radius 1.26 times that of Jupiter, it was detected using two different methods. Its proximity should make possible research that is difficult to perform on other extrasolar planets.

SOURCE *ASTRONOMY AND ASTROPHYSICS*, VOL. 441 (1)

DATE OCTOBER 4, 2005

A COSMIC BABY-BOOM

A French-Italian team observed a large population of galaxies formed when the Universe was only between 1.5 and 4 billion years old. They are two to six times more numerous and produce two to three times more stars than previously observed. This team analyzed a sample of over 8,000 galaxies using the Vimos instrument it had developed, installed at one of the telescope sites of the European Southern Observatory (ESO). An in-depth revision of the theories about how galaxies are formed is foreseeable.

SOURCE *NATURE*, VOL. 437 (7058)

DATE SEPTEMBER 22, 2005

A NEW TELESCOPE ON THE LOOKOUT FOR COSMIC RAYS

The world's largest observatory of cosmic rays has been inaugurated. The Pierre Auger Observatory comprises a network of fluorescence telescopes and 1,600 water sensors spreading over 3,000 square kilometers in the Argentinean province of Mendoza, at the foot of the Andes. Its goal is to trace cosmic rays, the mysterious, ultra-high energy particles that reach the Earth. Their exact nature and origin (probably from violent astrophysical phenomena such as supernovae) are still largely unknown. CNRS (IN2P3 and INSU) is intensely involved in this project, which it co-founded.

SOURCE PRESS RELEASE

DATE NOVEMBER 28, 2005

EINSTEIN AND BLACK ENERGY

The mysterious black energy, supposedly responsible for the acceleration and expansion of the Universe, may be Einstein's cosmological constant. This is one of the first results of an international joint effort to accurately measure this strange form of energy in order to determine its nature.

SOURCE *ASTRONOMY AND ASTROPHYSICS*, VOL. 442 (3)

DATE NOVEMBER 21, 2005

A NEBULA OVERFLOWING WITH HYDROCARBONS

A French-Spanish team has discovered large quantities of small hydrocarbons in the 'mane' of the Horse Head nebula. This discovery came as a complete surprise, as these molecules are supposedly destroyed by the UV rays present in the nebula. They may result from the fragmentation of more complex hydrocarbons.

SOURCE *ASTRONOMY AND ASTROPHYSICS*, VOL. 431 (1)

DATE FEBRUARY 21, 2005

A GOOD HARVEST OF GAMMA SOURCES

Eight new sources of very high energy gamma rays located in the central regions of our galaxy were revealed by the HESS international team. The gamma rays produced in particle accelerators like supernovae represent a unique source of information on very high energy cosmic phenomena.

SOURCE *SCIENCE*, VOL. 307 (5717)

DATE MARCH 25, 2005

THE FIRST IMAGE OF AN EXTRASOLAR PLANET

An international team including CNRS research scientists has produced the first image of an exoplanet. Orbiting around a very small star, a brown dwarf, the planet is 5 times more massive than Jupiter and is located 230 light years from us. It was first detected in 2004 by the NACO instrument of the Very Large Telescope in Chile, and then by Hubble. We were waiting for confirmation that it was not a background object but indeed a planet around the brown dwarf. Now we know for sure.

SOURCE *ASTRONOMY AND ASTROPHYSICS*, VOL. 444 (2)

DATE DECEMBER 2005

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