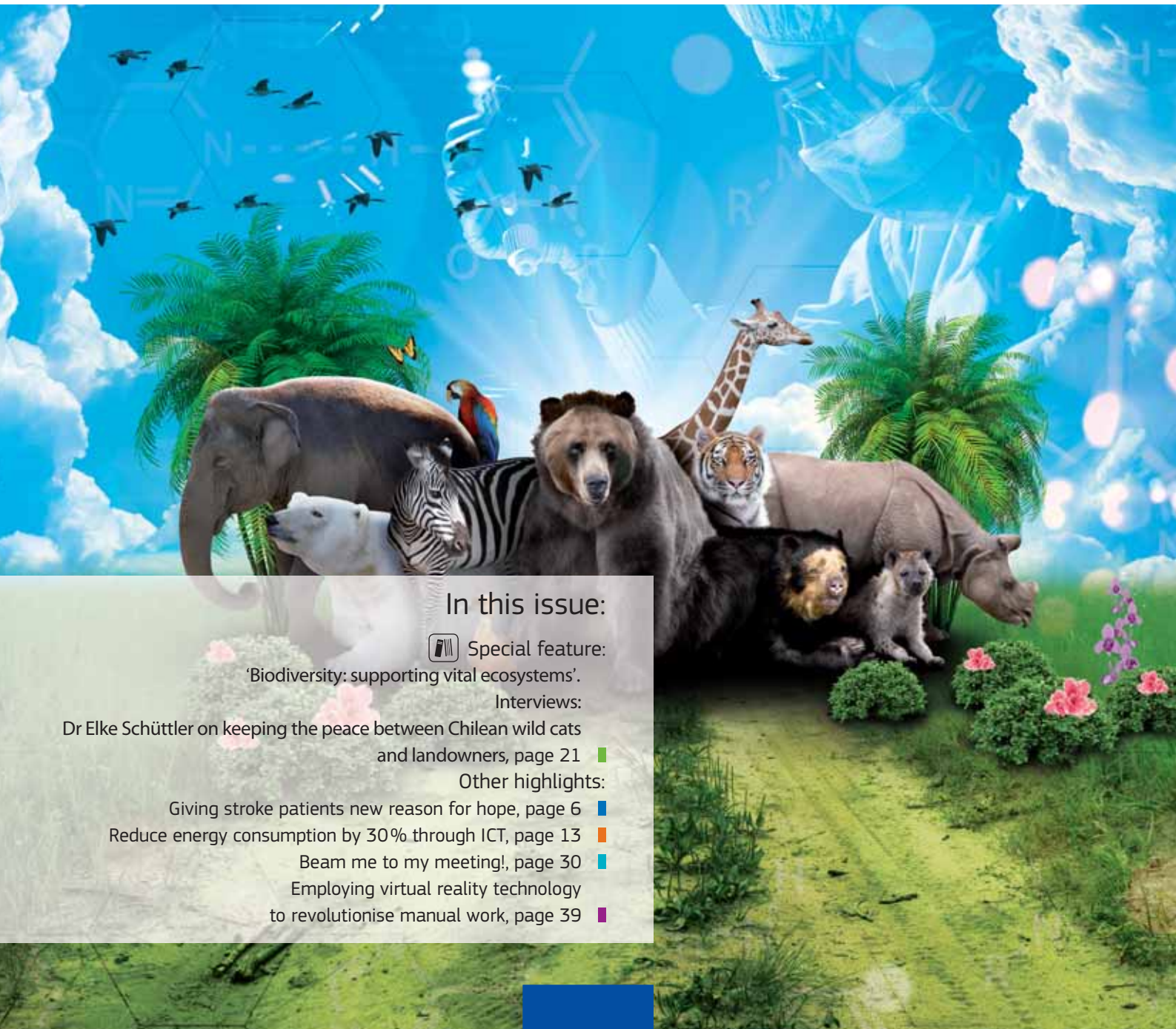
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Can biodiversity be safeguarded in a globalised world?



If a single word had to be considered reminiscent of the beginning of the 21st century, 'crisis' would certainly be the winner. One crisis could be summed up by this dilemma: should society pursue economic development at the expense of the planet, or should it switch its model for growth towards a new, more sustainable one, even if it means giving up deep-rooted habits?

This question has been at the heart of scientific and political debates for years — but as the debate continues, Earth is facing irreversible changes. Instead of the 'normal' loss rate of one to five species per year, dozens are becoming extinct every day because of human activities, making the current extinction of plants and animals the worst since the loss of dinosaurs some 65 million years ago. According to a study published by *Birdlife International Cambridge* in October 2012, changing this trend would cost about EUR 57 billion a year, a bill that few seem ready to pay. This is quite ironic, considering that the study also found the cost of doing nothing would be no less than... EUR 1.5 to 4.5 trillion per year.

In the meantime, European research is helping to show that many species could be saved with proper funding and a strong political commitment. The focus of this issue of *research*eu results magazine* is therefore 'Biodiversity: supporting vital ecosystems'. In this edition we interview Dr Elke Schüttler of the Helmholtz Centre for Environmental Research in Germany, whose research on finding common ground between an endangered species, the kodkod cat of Chile, and its human neighbours could — if successful — be a very practical response to some of the dilemmas concerning sustainability and biodiversity.

The 'environment and society' section continues with other examples of biodiversity-related research. These 'specials' start on page 22 with 'Scientists put spotlight on marine biodiversity in Europe'.

The 'biology and medicine' section opens on page 6 with an article entitled 'Giving stroke patients new reason for hope', while the feature article in the 'energy and transport' section hints at how to 'Reduce energy consumption by 30 % through ICT', on page 13.

The 'IT and telecommunications' section begins with the *Star-Trek*-inspired 'Beam me to my meeting!' on page 30. Finally, the 'industrial technologies' section starts with 'Employing virtual reality technology to revolutionise manual work', on page 39.

The issue ends, as usual, with a list of events and upcoming conferences.

We look forward to receiving your feedback on this issue and on the *research*eu* publications in general. Send questions or suggestions to:

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The editorial team

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Watch this space!

Coming up in issue 20 of *research*eu results magazine* — a special dossier on women in science.

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BIOLOGY AND MEDICINE



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Giving stroke patients new reason for hope

Disturbances in the blood supply to the brain can lead to rapid loss of brain function, causing a stroke. While potentially fatal, this can have life-changing consequences for survivors. Two EU projects aim to ensure that for thousands of patients, there is life — and hope — after such a trauma.

Thousands of European stroke patients live with disabilities, which often severely impact their quality of life and cost taxpayers billions in health care. Substantial sums have been dedicated to developing effective therapies but, to date, these remain limited.

In this context, leading European stroke researchers and clinicians have teamed up with small businesses involved in cutting-edge R&D to push for promising new therapies. In fact, two such EU-funded projects are currently under way: the EUSTROKE[1] and the ARISE[2] consortia.

The European Stroke Network

The EUSTROKE team aims to improve our understanding of the neurovascular system to enable better prevention and treatment of stroke. ARISE, meanwhile, is developing and trialling new therapies to induce repair of lost function, which will potentially bring relief and new hope to thousands of sufferers.

'From the beginning, the European Commission encouraged us to work closely together,' explains EUSTROKE coordinator Stephen Meairs. 'We first formed common platforms for conducting clinical trials and training young scientists. We decided to use the same stroke models and methods, and also to share imaging advances. The ultimate co-operation, however, was the total merging of the two consortia to form the European Stroke Network (ESN). This allows us to optimally use European resources and bring the best minds in stroke research together to combat this devastating disease.'

Major breakthroughs

This unique ESN co-operation has led to a number of breakthroughs, such as the development of novel concepts for the treatment of life-threatening brain swelling after a stroke. Interestingly, ESN researchers have learned that stroke outcome can be improved by enriching the treatment environment. This can be accomplished, for example, if patients play games or pursue interesting activities in the recovery phase. By employing sophisticated imaging techniques, scientists in the ESN have been able to show how such activities lead to a remarkable formation of new brain connections.

In another attempt to enhance the therapy of acute stroke, ultrasound physicists and stroke researchers have joined forces to develop new ways to break up blood clots in brain vessels with acoustic energy. An exciting addition to acute stroke therapy is an innovative immunotherapy to prevent the delayed neurotoxic effects of the thrombolytic 'tissue Plasminogen Activator' (tPA). The first human trials using this approach are planned.

The complex role of inflammation in stroke has also been examined. It was discovered that chronic systemic infection increases ischemic and blood-brain barrier damage, leading to sustained cerebrovascular inflammation. Novel therapeutic targets have since been identified, and a clinical trial based on this research is being planned.

Further innovative research by the ESN has involved the integration of pioneers in nanoparticle drug delivery for treating stroke with substances that were not previously suitable for this purpose. Such advances have led to recently established co-operation with the Canadian Stroke Network to study novel ways for supporting functional recovery and the regeneration of brain tissue after stroke. Importantly, multi-disciplinary research has also led to unexpected observations that challenge old dogmas.

Meeting of minds

A particular strength of the EUSTROKE network, says Prof. Meairs, is the fact that it brings together people from different fields. A multiple sclerosis expert, for example, can view tissue inflammation in a different way, which can help lead to new ideas and discoveries.

'The various impacts of a stroke and the subsequent reorganisation and repair of the brain are highly complex,' explains ARISE coordinator Professor Ulrich Dirnagl. 'Developing successful strategies for brain protection and repair therefore requires a joint effort involving experts in basic neuroscience, vascular biology, neuro-immunology, neuro-protection, neuro-regeneration, drug delivery and clinical stroke neurology.' Furthermore, the project has involved stroke patients from the beginning, and they are included in discussions through the Stroke Alliance for Europe, an important member of the network.

Through co-operation and innovative thinking, ESN research has the potential to substantially contribute to improving the quality of lives of stroke sufferers. 'A stroke can be devastating,' says Prof. Meairs. 'And there is simply nothing else that absorbs so many billions of euros in care. Stroke is the biggest cause of disability and it's getting worse. So we have very good reasons for attacking this problem.'

The European Stroke Network is bringing a wide range of resources and expertise to develop solutions to this growing issue, and is becoming a hub for the recruitment of additional European centres within and outside the consortium. It is also enhancing the trans-European flow of information on stroke research from stroke patients to governmental agencies. Recently, the ESN has expanded its co-operation with projects across the Atlantic, underlying the global impact of this field of research.

1 'European Stroke Research Network', coordinated by Ruprecht-Karls-Universitaet Heidelberg in Germany.
2 'Affording Recovery in Stroke', coordinated by Charité Universitätmedizin Berlin in Germany.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Health'.
http://ec.europa.eu/research/infocentre > search > news > 27793

Innovative treatments heralded for epilepsy patients

Novel approaches are being used in the treatment of epilepsy, a devastating neurological disease that affects 50 million worldwide, 6 million of whom are in Europe. This research targeting epilepsy involves using viruses to infect brain cells, and transplanting cells into the brain.

The project pioneering this alternative treatment is entitled Epixchange[1]. Work will be carried out at Lund University, Sweden, in collaboration with Italian, Danish and French researchers from academic institutions and small and medium-sized enterprises (SMEs). The total budget for the project is almost EUR 1 million and it is funded by the European Union.



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Often referred to as a seizure disorder, epilepsy is usually diagnosed after a person has two seizures that were not caused by a known medical condition or by extremely low blood sugar. The seizures are caused by sudden, usually brief, excessive electrical discharges in a group of brain cells (neurons). One seizure does not signal epilepsy — up to 10 % of people worldwide will have one seizure during their lifetime. Epilepsy is one of the world's oldest recognised conditions, but it can be treated with anti-epileptic treatments in around 70 % of cases.

A significant part of the costs of neurological diseases can be associated with epilepsy. In Sweden, where Epixchange was devised, 60 000 people suffer from the condition. However, around 30 % to 40 % of these patients are resistant to pharmacological treatments, which are mostly symptomatic and often have side effects. Therefore, the main objective of Epixchange is to explore innovative gene therapies for epilepsy treatment.

The project will explore the development of encapsulated human cell lines producing the neurotransmitter galanin and the neuropeptide Y (NPY) and their effect on epileptic seizures. It will use viral vectors to deliver neuropeptides and other proteins – neurotrophic factors — into the brain to suppress seizures. These novel approaches will lay the foundation for developing alternative treatment strategies for epilepsy.

Epilepsy accounts for 0.5 % of the global burden of disease, a time-based measure that combines years of life lost due to premature mortality and time lived in states of less than full health. Epilepsy has significant economic implications in terms of healthcare needs, >

premature death and lost work productivity.

Although the social effects vary from country to country, the discrimination and social stigma that surround epilepsy worldwide are often more difficult to overcome than the seizures themselves. People with epilepsy are frequently targets of prejudice.For example, in the United Kingdom, a law forbidding people with epilepsy to marry was repealed as recently as 1970. In the 1970s, in the United States, it was legal to deny people with seizures access to restaurants, theatres and recreational centres. The stigma associated with the disorder has often discouraged people from seeking treatment for symptoms and becoming identified with the disorder.

However, this is changing, and a viral vector approach to delivering genes of interest into the brain is already a reality. Several studies for Parkinson's disease have been performed in clinical settings in the United States. According to Professor Merab Kokaia of Lund University, the plan is to perform such clinical trials in Lund on patients with severe epilepsy who do not respond to drug treatment.

The project was coordinated by the Universita degli Studi di Ferrara in Italy.

1 'Innovative gene therapies for epilepsy treatment'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/news > search > 35241

New tools for Friedreich's Ataxia

European researchers have joined forces to build on knowledge related to the neurological disorder 'Friedreich's Ataxia' (FRDA). Information on the disease's pathogenesis and causative mechanisms, coupled with new tools for studying the illness, will contribute to the development of novel therapies.

FRDA is a rare debilitating neurological disorder that progressively leads to loss of the ability to walk and to growing dependency for all activities. Despite the discovery that the 'frataxin' gene is responsible for FRDA, little is available in the way of therapy.

The key objective of the EU-funded Efacts[1] project is to form the body of expertise needed to perform a translational study on FRDA patients. The Efacts partners are implementing a European patient registry database of demographic and family information — including medical history, data on daily activities, functional tests and a cardiologic evaluation.

Along with the database, a biological samples repository has been established, where samples are stored for future genotype-phenotype analysis and for studies on biomarkers, modifier genes and epigenetics. Cardiologic evaluation of FRDA patients through ultrasound indicates morphological and functional abnormalities of the left ventricle.



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New insight into the role of the frataxin protein reveals its association with an iron-sulphur assembly complex (formed by the proteins ISCU, NFS1 and SD11) that acts as a chaperone protein for iron. Iron accumulation has been associated with various neurodegenerative disorders, including Parkinson's and Alzheimer's diseases.

Altered function of the frataxin protein leads to changes in iron homeostasis and inappropriate activation of 'Iron-responsive element binding proteins' (IRPs). This culminates in suppression of mitochondrial biogenesis.

Investigation of the mechanisms responsible for silencing of the frataxin gene has led to the discovery of epigenetic histone and DNA modifications. These could potentially serve as future targets for therapeutic intervention. To this end, partners are currently exploring the effect of histone deacetylase inhibitors — compounds that open up the chromatin and enable gene expression — to revert frataxin silencing.

The need for better animal and cellular models of FRDA has been recognised by the Efacts consortium, which is generating transgenic mice that carry the GAA repeats seen in the human frataxin homologue. Cellular models generated from 'Induced pluripotent stem cells' (iPS) from mice or patients are being used to study neuron morphological alterations — including degenerating mitochondria and mitochondrial iron deposits. Except for reduced frataxin levels, these cells demonstrate an abnormal electrophysiological phenotype.

Collectively, the Efacts consortium has made significant progress into the biology of FRDA, combining experimental data and patient information analysis. The outcome of the study has strong potential to become translated into therapeutic interventions.

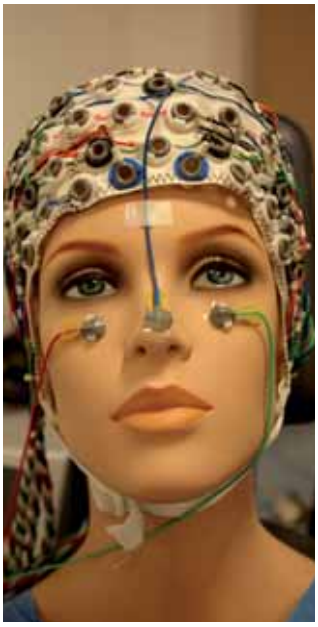
The project was coordinated by the Université Libre de Bruxelles in Belgium.

1 'European Friedreich's Ataxia consortium for translational studies'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Health'.
http://cordis.europa.eu/marketplace > search > offers > 10246

Novel reconstruction techniques for studying the brain

European scientists have developed a real-time, non-invasive method for monitoring brain activity. The new methodology is expected to have broad applications for obtaining clinically relevant information, especially from epileptic patients.



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The monitoring of brain activity is instrumental in cognitive neuroscience as well as in clinical diagnosis of various brain disorders. In epilepsy, detection of the brain area undergoing seizure is performed by measuring neural activity through implanted electrodes using the intracranial electroencephalography (iEEG) method. However, the invasiveness of this technique causes severe discomfort to epileptic patients.

To overcome this, the EU-funded Oscillatory Dynamics[1] project examined the possibility of developing non-invasive methods to monitor brain activity in epilepsy. The primary project goal was to resolve the neural activity of deep brain structures, such as the amygdala, hippocampus, brainstem and cerebellum.

Scientists compared the non-invasive technique magnetoencephalography (MEG) with iEEG to map brain activity by recording the electric currents in the brain. The data produced was combined with time-frequency analysis to produce five-dimensional maps of brain activity.

MEG and iEEG data was acquired simultaneously from epileptic patients in order to assess the ability of these two modalities to resolve the activity of deep brain structures. An MEG/iEEG analysis toolbox (Nutmeg) was subsequently developed for reconstructing the spatiotemporal dynamics of neural activations and linking them with magnetic resonance (MRI) images. The software was made publicly available at http://nutmeg.berkeley.edu.

The software was applied and tested on auditory brainstem responses and auditory discrimination following appropriate stimulation. The success of MEG (and possibly iEEG) as a tool for examining both normal and pathological hippocampus makes scientists confident that deep brain activity will be monitored more efficiently and less invasively in the future.

The project was coordinated by the Institut National de la Santé et de la Recherche Médicale (INSERM) in France.

1 'Examining oscillatory dynamics with magnetoencephalography and intracranial electroencephalography'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/marketplace > search > offers > 9602

Minimising food poisoning from poultry

Food poisoning incidents due to bacteria in poultry are on the increase. Scientists are developing methods to control the bacteria at the farm level.



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Campylobacter is a genus of bacteria that is now the leading cause of bacterial food poisoning. The bacteria are present in the intestinal tract of a wide variety of wild and domesticated animals that show no outward symptoms of infection. Following slaughter, bacteria can be inadvertently transferred from intestinal tract to meat. *Campylobacteriosis* is most often caused by contact with raw or undercooked poultry.

International concern is rising in the face of increasing incidences of *Campylobacter* infection worldwide. On-farm control in poultry could have a significant impact on human health and safety. Responding to this urgent need, European scientists initiated the EU-funded Camcon[1] project. The focus is on young, tender chickens ('broilers') produced in specific parts of Europe.

The project began with a detailed questionnaire sent to poultry farms throughout Europe, the first of its kind, regarding management and biosecurity practices in broiler production. Flocks in each country were then tested for campylobacter. The majority of flocks in each country tested positive for the bacteria before slaughter. No farm remained consistently negative throughout the testing.

Scientists have also tested and compared a variety of sampling and detection methods, concluding that the air in broiler houses is the most suitable target to look for indicators. Methods to sample and quantify campylobacter in the air were then developed. Preventive measures have also been initiated, including the implementation of fly screens and the first *in ovo* vaccination using a potential vaccine.

The consortium is currently preparing a best practice manual that will be evaluated at a test farm in Spain. A preliminary test of a video and pilot learning programme has also been carried out. Camcon is expected to make an important contribution to controlling the bacteria found in farmed poultry that are associated with the majority of food poisoning cases in people.

The project was coordinated by the Veterinaerinstituttet (National Veterinary Institute), Norway.

1 '*Campylobacter* control — novel approaches in primary poultry production'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Food, agriculture and fisheries, and biotechnology (KBBE)'.
http://cordis.europa.eu/marketplace > search > offers > 10253

BIOLOGY AND MEDICINE

Myelin repair mechanisms for the leukodystrophies

A major European project, Leukotreat[1], is tackling the diagnosis and treatment of a rare set of neurodegenerative diseases, the leukodystrophies (LDs). Using a powerful integrated interdisciplinary approach, the project is developing new diagnostic biomarkers and targeted therapies.



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Rare neurodegenerative diseases affecting the myelin in the white matter of the nervous system cause the so-called LDs, primarily in children. The outcome is often a gradual decline in a child who initially appeared well, with symptoms including the progressive loss of body tone, movements, gait, speech, ability to eat, vision, hearing, and possibly a slowing of mental and physical development.

As there is no cure at the moment, the Leukotreat project is trying to develop therapies by focusing on the development of myelin repair mechanisms and neuro-protection.

Central to the project is the creation of a database accessible at http://leukotreat.eu. Forms in French and English are made available to patients. Information is being collected from clinical data, biological samples and mutations in seven well-defined forms of LD. The LeukoDataBase user chart and patient consent forms have been drawn up with the Laboratoire d'Ethique Médicale (LEM) and Leukotreat ethics committees.

To date, the research has successfully yielded many deliverables. Validation of identified biomarkers has resulted in details of the biochemical roles of N acetyl aspartate (NAA) and N-acetylaspartylglutamate (NAAG) in some LDs. NAAG (but not NAA) stimulates the membrane of the myelinating cells (oligodendrocytes) through excitatory glutamate receptors, NMDA, without damaging the cells. Therefore, NAAG may contribute to the abnormal myelination observed.

The Leukotreat team has screened for new biomarkers by investigating the role of oxidative stress in the axonal degeneration common to different forms of slow progressive LDs via a novel lipidomics analysis. As an example, project scientists found that nearly all cells in the spinal cord of a special mouse model — X-linked adrenoleukodystrophy (X-ALD) — exhibit reactive oxygen species (ROS). The project has implemented the necessary tools to conduct an analysis of lipidomics and LC-MS data, and has also developed new chromatographic separation protocols.

Improved understanding of the pathophysiological pathways has allowed Leukotreat to screen new molecules capable of acting against the disease. Modes of action include anti-oxidant or anti-inflammatory activities, ability to clear misfolded proteins or enhance translation in appropriate *in vivo* or *in vitro* models. In preclinical therapy trials, genes were targeted for modulation of expression or enzyme replacement.

Following this success, Leukotreat aims to gain further insight into the natural course of LD epidemiology and genotype-phenotype correlation. Data will be collected through a common platform open to any hospital in Europe. This strategy will widen the net which is important for rare diseases and encourage the development of new reference centres, mainly thanks to the new Leukotreat diagnostic tool. The processing of patients' samples will accelerate the identification of new biomarkers for this set of debilitating diseases.

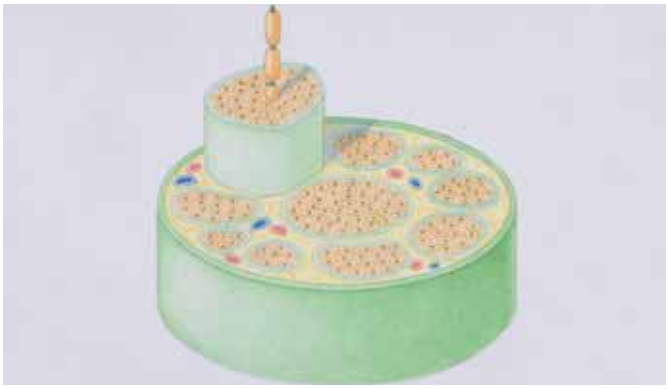
The project is coordinated by the Université d'Auvergne Clermont-Ferrand 1 in France.

1 'Therapeutic challenge in Leukodystrophies: Translational and ethical research towards clinical trials'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Health'.
http://cordis.europa.eu/marketplace > search > offers > 9614

A novel way for inferring DNA-protein binding

Understanding the molecular interactions between proteins and DNA is central to studying various biological processes. In line with this aim, an EU-funded project has developed an 'in silico' approach for predicting the DNA binding specificity of proteins.



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The thorough characterisation of individual nucleic acid binding proteins is of primary importance for delineating the complex interplay of gene regulatory networks. In transcription and translational regulation, as well as the cell cycle, accumulating evidence is pointing towards the role of proteins which do not assume a fixed conformation in the native state, but become ordered upon binding. Available predictors, however, can only provide information regarding the structure of such protein regions but not their ligand types and mode of interaction.

The primary focus of the EU-funded PROTDNABINDSPEC[1] project was to predict the binding pattern of such natively unfolded protein regions. By using structural bioinformatics, scientists designed, implemented and tested a method to predict the

DNA-bound conformation of disordered protein regions at atomic resolution.

As a first step, the interaction energy between different amino acids and nucleotides was computed and put into the Fragfold method of protein folding prediction. The predicted DNA-binding specificity of various natively unfolded protein regions was subsequently used to identify DNA binding sites in the genome and was validated on an experimental basis.

The PROTDNABINDSPEC project deliverables are expected to improve our understanding of the molecular details of DNA-protein macromolecular interactions. Over the long term, this method will pave the way for the identification of novel targets and the design of regulatory molecules.

The project was coordinated by University College London in the United Kingdom.

1 'Inferring DNA binding specificities through in silico folding of natively unstructured protein regions'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/marketplace > search > offers > 9598

Glucose stimulation for insulin movement

Type 2 diabetes affects some 22.5 million people in the EU. A European project has been investigating the biochemical culprits that cause insulin output to falter.

During a meal, beta cells in the pancreas respond to the rise in glucose level in the bloodstream. The insulin is carried in so-called large dense core vesicles (LDCVs), and problems with transport and fusion of these vesicles is one of the causes of type 2 diabetes.

Recent studies in the Insulin Secretion[1] project have shown that motor proteins like kinesin drive the movement of LDCVs. The consortium aimed to investigate the mobilisation of the vesicles from the storage pool in the cell to release sites at the beta cell plasma membrane.

One such motor protein under investigation was myosin Va. The brain-spliced isoform of myosin Va (BR-MyoVa) is essential for transport of hormones in secretory granules (SGs) in most secretory cells. Although the nature of the protein complex that brings BR-MyoVa to SGs for their transport is unknown, the Insulin Secretion project identified several binding protein partners that are involved in this process. These include granuphilin-a/b, Rab27a and rabphilin-3A. The study indicates there are many binding partners of BR-MyoVa to regulate SG movement.

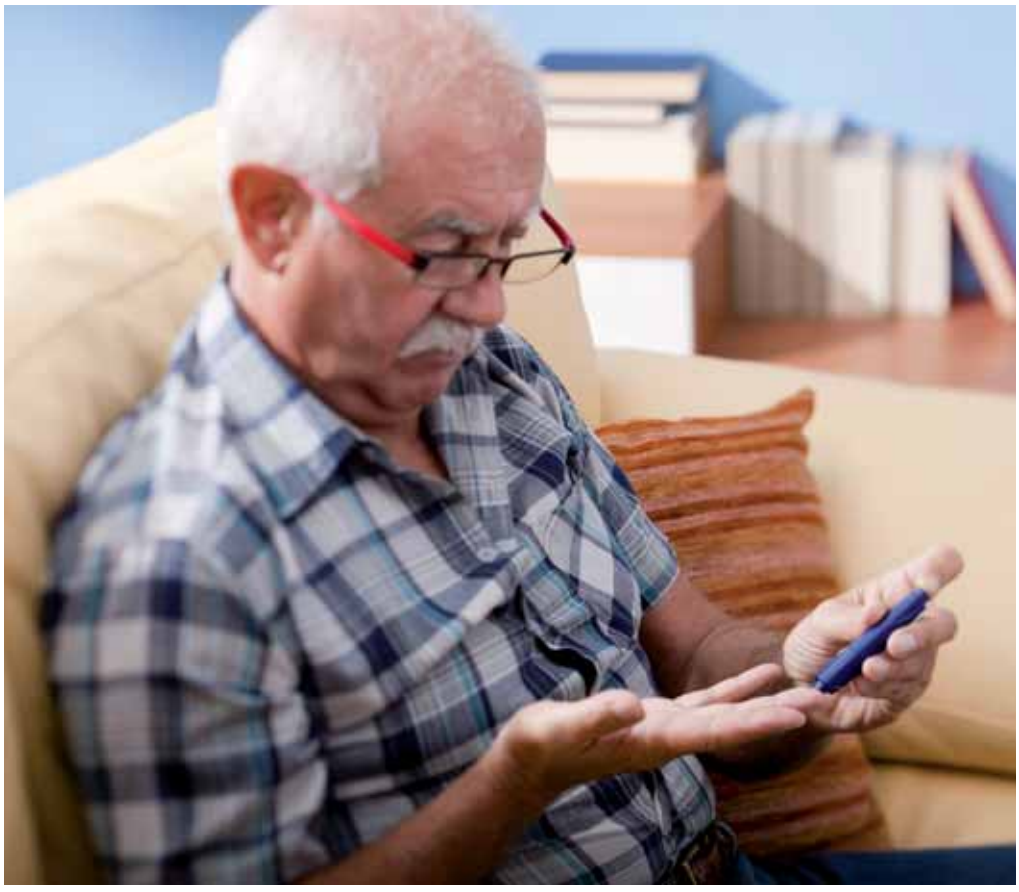
Along with evidence for multiple novel binding partners of BR-MyoVa came the discovery of MyRIP, which seems to be important for stabilising MyoVa. MyRIP acts as a scaffolding protein that links protein kinase A (PKA) to the SGs.

Another piece of the puzzle was solved with evidence that the metabolic enzyme ATP-citrate lyase (ACL) also plays a part in insulin secretion. ACL is an important enzyme for glucose metabolism. The team also showed that ACL is able to translocate to vesicles in a glucose-dependent manner and is a probable first as an example of a clear link between metabolism and LDCV movement in beta cells.

For future research, Insulin Secretion scientists have produced a phosphorylation mutant of Rph-3A, an interacting partner of MyoVa. The impact of Rph-3A on hormone secretion will be investigated.

Project results give details of molecules crucial to the secretion in response to glucose. Knowledge of the specific molecular actors responsible in the cascades promises to lead research closer to more targeted drug therapies for metabolic diseases like type 2 diabetes.

The project was coordinated by University of the West of England, Bristol Research, Business and Innovation in the United Kingdom.



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1 Regulation of glucose-stimulated secretory vesicle mobilisation in pancreatic beta-cells'.

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BIOLOGY AND MEDICINE

Targeting colon cancer cells

The physical symptoms of colorectal cancer often arise too late for effective treatment via surgical intervention or chemotherapy. European research is developing small molecules or antibodies that will specifically target colon cancer cells.

To develop targeted therapy, it is crucial to acquire knowledge on the biochemistry and genetic basis for biochemical pathways involved in colorectal cancer. The GUT GENE Regulation[1] project looked into chemical candidates involved in gut cell development and differentiation.

The key pathway involved in normal intestinal development and progression to colon cancer is the Wnt signalling pathway. Over 80% of colorectal cancers result from a mutation in this cascade.

As differential regulation of Wnt target genes leads to the development of colon cancer, the researchers sought to identify unique molecular players in the Wnt pathways. By implication, these new molecules may be involved in carcinogenesis. Another potential source of molecules for specific cancer therapy came from the vast pool of gene regulators that lie perhaps hundreds of kilobases away from their targets.

GUT GENE Regulation scientists used mouse intestinal epithelium, a rapidly renewing tissue under the control of the Wnt pathway. The researchers applied affinity purification that makes use of specific binding interactions between molecules, as well as mass spectrometry. Several candidate molecules were identified in the beta-catenin/TCF4 complex, which is thought to drive the expression of Wnt target genes.

Among potential target molecules identified was the kinase TNIK. As a result, Wintherix LLC, a company that specialises in small molecule therapy, has initiated a study into possible kinase inhibitors. Along with TNIK, project scientists also identified an enzyme DOT1L for therapeutic selection. Both molecules have been the subject of scientific journal articles.

Details of the importance of another candidate molecule have also been published. MAP3K1 E3 ubiquitin ligase, for instance, is active in the positive regulation of the Wnt/b-catenin pathway and Wnt target gene expression.

Project studies have resulted in the identification of both novel genes and enzymes that are involved in Wnt signalling. As such, they provide research material for the development of target-specific drugs for the treatment of colorectal cancer.



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The project was coordinated by the Erasmus Universitair Medisch Centrum Rotterdam in the Netherlands.

1 'TCF4 transcriptional program in crypt stem cells and resulting differentiated cells'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/marketplace > search > offers > 9607

Unravelling the molecular basis of immune suppression

European scientists are investigating the molecular programmes underlying immune suppression. The focus is on a particular subset of T lymphocytes implicated in autoimmune disorders, allergies and cancer.

Our body responds to infection through the immune system, a specialised network of cells and molecules that coordinate to fight the invading threat. At the same time, the immune system learns from this experience and becomes precisely regulated to tolerate self-antigens.

Central to this tolerance is a population of T lymphocytes known as regulatory T cells (Treg). Although many aspects of Treg cell biology have been studied extensively, the precise molecular changes in cells that are being suppressed remain almost completely uncharacterised.



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In this context, the EU-funded project TREG Suppression[1] has been designed to provide a better understanding of the molecular changes that take place as a result of Treg-mediated suppression. In addition, the extent to which these biochemical pathways could be exploited for therapeutic purposes will be investigated.

Scientists have analysed the gene expression profile of suppressed T cells and dendritic cells to identify TGF-beta and other signalling pathways that are implicated in Treg cell suppression. These findings will be extrapolated in human cells to discover similarities and differences and to identify candidate genes involved in the process.

The function of some of the molecules identified will also be studied *in vivo* in generated animal models. Collectively, the findings of the TREG Suppression initiative are envisaged as being useful for a wide variety of diseases, with the possibility that targeting a single molecule regulated by Treg cell-mediated suppression could be beneficial for the treatment of these diseases.

The project was coordinated by the Karolinska Institutet in Sweden.

1 'Deciphering the molecular basis of regulatory T cell suppression'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
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Reduce energy consumption by 30 % through ICT

According to a European research project, cities may be able to reduce their energy consumption by 30 % by leveraging 'Information and communication technologies' (ICTs).

This finding was made by the Enersip[1] project, which is formed by 10 partners from five European countries, and has received EUR 3.99 million in funding from the EU's Seventh Framework Programme (FP7) under the theme for 'ICT support to energy-positive buildings and neighbourhoods'. Their results were presented after analysis showed how to optimise the use of residential energy consumption and generation infrastructures.

The scientists and researchers participating in the Enersip project, led by the Spanish company Tecnalia, have designed, developed, and validated an ICT platform that allows residential electrical consumption to be reduced by 30 %, while also integrating micro-generation installations using renewable energy, such as photovoltaic solar panels installed on the roofs of homes.

The key to this achievement is the result of a two-pronged strategy: first, reducing the electricity consumption in homes (by around 15-20 %); and secondly, adjusting the consumption and generation of electricity in districts (by the same amount). According to Professor José Ignacio Moreno, of Universidad Carlos III de Madrid (UC3M), the system 'gives the users information regarding their consumption, allowing them to identify the appliances that use the most energy. It then suggests possible solutions, attempting to modify certain behaviours and fomenting good practices that enable consumers to reduce their electricity bill.'

Through these means, the Enersip platform allows appliances to be monitored by networks of sensors and actuators so that they can be controlled wirelessly using web applications.

The Enersip project team designed the system to automatically allow the consumption in homes within a district to be adjusted as much as possible, so that they use renewable energy generated by sources from within the same district, reducing energy flows and, as a consequence, energy losses and costs. 'This type of action falls within what is known as electricity demand management,' said Gregorio López, another of the UC3M researchers.

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For example, he added, the temperature could be raised by a few degrees in the summer (or lowered in winter) in hundreds of thousands of homes during the periods of lowest production of renewable energy in a district, or the programmed running of certain appliances (dishwashers, washing machines) can be moved to a time period when renewable energy production is at its peak. 'Of course,' López pointed out, 'those households would have agreed in advance to participate in this type of programme in exchange for certain incentives, and pre-established levels of comfort would never be compromised.'

One of the benefits of the Enersip platform is that it only needs a few basic ICT installations to make it work. Specifically, it would require a network with sensors and actuators to create the consumption and micro-generation infrastructure, as well as an internet connection and a web application to enable access from any web-enabled device. The Enersip project also uses a dedicated core communications infrastructure that offers certain advantages.

'It could be implemented from any home equipped with the typical consumer infrastructure or consumer and micro-generation infrastructure,' José Ignacio Moreno explained.

The team he heads at UC3M was in charge of the formal design and modelling of the communications architecture of the Enersip platform, as well as the software simulations to evaluate the architecture's performance. He participated in the design and definition of the platform's integration and validation phases and presented the research's progress in the form of technical articles at key communication conferences, such as INFOCOM 2011 and ICC 2012.

The Enersip consortium included leading companies and research centres from Belgium, the Czech Republic, Israel, Portugal and Spain — and was coordinated by the Fundacion Tecnalia Research & Innovation in Spain.

1 'Energy saving information platform for generation and consumption networks'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Transport'.
http://cordis.europa.eu/news > search news > 35246

New data communications to improve European airspace safety

Revolutionising aerospace communications could bring about significant improvements for aircraft in Europe's airspace. By using the latest innovative technology in air transportation, radical changes can be made to reduce the extra costs of fragmented airspace, estimated at EUR 5 billion each year.

Current systems are unable to process and provide flight information in real time in European airspace. The processes and procedures do not provide the flexibility needed to meet growing demand, and new security requirements are affecting the ability to efficiently move people and cargo. The tools to facilitate air transportation have already approached their limits. The United States, as an example for comparison, controls the same amount of airspace as Europe, but with more traffic, and at almost half the cost.

Eradicating these problems is the aim of Sandra[1] a new data-link architecture which will develop concepts for air traffic management (ATM) using Next-Generation IP Networks for passenger communications and in-flight entertainment and infotainment. Co-funded by the European Commission under the Seventh Framework Programme for Research (FP7), this cutting-edge technology will help cope with future rises in aircraft operations, which are expected to at least double by 2025.

With the new system in place, aircraft will have multiple data or voice links active simultaneously. These links will be available based on the geographical location and on the particular subset of communication systems deployed on board, which may vary from aircraft to aircraft. On a typical flight around the globe, the aircraft may utilise several link types provided by different providers to implement a variety of services.



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Travellers will also reap the benefits, with reduced costs and delays, and improved efficiency, capacity, security and safety of their air transport system. Increasingly, there has been growing demand for mobile access to broadband networks while on board. So in response to this, several airlines are evaluating technology to deliver this.

Aviation is a sector that makes a vital contribution to the EU's economy and employment, supporting 5.1 million jobs and contributing EUR 365 billion, or 2.4% to European gross domestic product (GDP). In the long term, global air transport is expected to grow by around 5% annually until 2030. As traffic increases, so do concerns about safety, which is why EU aviation policy aims to ensure Europe has the safest air space in the world.

The integrated Sandra system will provide a sustainable service ready to be commercially exploited by European airlines. This, in turn, will guarantee a service which is affordable for all passengers and service providers, using technology developed by European manufacturers.

Test-bed and in-flight trials are planned for Sandra in May 2013 at the airports in Oberpfaffenhofen, Germany and Toulouse, France.

The project was coordinated by Selex Elsag spa in Italy.

1 'Seamless aeronautical networking through integrations of data links, radios and antennas'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Transport'.
http://cordis.europa.eu/news > search news > 35220

Faster and 'greener' spacecraft

An EU-funded scientific team is developing prototypes for an 'Electric solar-wind sail' (E-sail) that will significantly reduce the time spacecraft need to reach their destination. This could open the door to a new wave of solar system discoveries.

Powering spacecraft has traditionally relied on chemical propellants and ion engines. But for long missions the quantity of propellant needed increases the launch mass to an extent that makes such missions very expensive.

Harnessing the power of the solar wind, a constant stream of charged particles ejected by the Sun, could provide renewable thrust for spacecraft propulsion. A solar-wind sail would reduce the time, cost and mass required for spacecraft to reach their targets in the solar system.

In 2006, Pekka Janhunen introduced the concept of an electric solar wind sail that provided tremendous improvements over the existing space propulsion methods.

An E-sail uses wire tethers unreeled in space like fishing lines. They are kept taut by centrifugal force and charged by an on-board electron gun powered by solar panels. They use the solar wind's charged ions as a natural source to produce thrust.

EU funding of the E-sail[1] project is enabling Janhunen and his team to develop the key technologies to prototype level. To date, scientists have already produced 300 metres of a four-wire tether. The goal of the E-sail project is to produce a one-kilometre sample tether using an automatic, scalable method.

They are also well on their way to building a prototype of the 'remote unit' at the tips of each main tether, as well as the necessary thrusters. The researchers have also demonstrated the successful reeling in and reeling out of a 30-metre long tether without problems.

The ESAIL project is expected to deliver prototypes of the key components of the E-sail, opening the door to a new era of efficient solar-system flight and huge opportunities for exploration of our solar system.



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The project was coordinated by the Finnish Meteorological Institute in Finland.

1 'Electric sail propulsion technology'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Space'.
http://cordis.europa.eu/marketplace > search > offers > 9640

A gentle, safe landing for spacecraft

EU-funded scientists are developing imaging technology for spacecraft sensors. The new technology will be critical to safe and soft landings for manned and robotic vehicles on extraterrestrial bodies.



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Several international robotic exploration missions are foreseen for the near future, focused on the Moon, Mars and asteroids. In order to land sensitive and expensive scientific payloads precisely on extraterrestrial bodies, spacecraft require highly accurate position and altitude-control equipment. Such equipment must be able to 'sense', or produce images of the three-dimensional (3D) surface in real time.

The Fosternav[1] project aimed to improve the current state of the art in spacecraft 'guidance, navigation and control' (GNC) sensors.

An emerging type of laser imaging technology — 'Flash light detection and ranging' (Flash LiDAR) — is rapidly gaining interest in the GNC community. A so-called Flash LiDAR system records a 3D image with a single laser pulse (a flash).

It is considered a critical technology for enabling autonomous landing of manned and unmanned spacecraft on the

Moon and Mars as well as for in-orbit docking procedures between spacecraft and samples transported from an object's surface. Fosternav researchers are developing sensors with active illumination integrated in a 3D Flash LiDAR architecture.

Active illumination will be important in increasing the accuracy and safety of GNC systems as ambient light may not be sufficient for obtaining clear images, or the target may be shadowed by other objects.

The novelty of the Fosternav LiDAR architecture is a controllable laser head that can generate several minimally divergent beams at once or a single beam with relatively large divergence.

This technology will enable the flash system to overcome its relatively low optical power density while enabling miniaturisation and simplification not possible with its sister technology, flying-spot LiDAR.

The Fosternav system is expected to have an important impact on the safety and reliability of future space exploration missions. In addition, the flash technology developed within the scope of the project could be the trigger for larger developmental activities enabling European flash technology to compete with the most advanced flash technologies from the United States.

The project was coordinated by the Centre Suisse d'Electronique et de Microtechnique SA (CSEM) in Switzerland.

1 'Flash optical sensor for terrain relative robotic navigation'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Space'.
http://cordis.europa.eu/marketplace > search > offers > 9633

Better connections for EU transport

Being able to change quickly and efficiently from one transport mode to another across Europe will upgrade the sector significantly and improve the standard of living.

Europe has long dreamed of having a seamless, interconnected transport system (intermodal transport), a vision currently hampered by the lack of studies and surveys on intermodality. The EU-funded project Hermes[1] investigated ways to improve the door-to-door travel experience by streamlining connections between short-haul and long-haul journeys.

The project produced a handbook of recommendations for cross-modal transport arrangements, helping transport operators, terminal managers and public authorities develop innovative business models that support intermodality. In addition, Hermes worked on 11 case studies in seven EU countries to analyse intermodal transfer points such as ports, railway stations and bus stations in order to map interconnectivity.

Another important outcome has been the development of two intermodal transport business prototypes to overcome a specific set of barriers related to intermodal links and transfers. Hermes also developed a knowledge database regarding the barriers to passenger intermodality, accompanied by measures and solutions to overcome them.

By identifying the barriers to flexible, seamless door-to-door quality transport, the project has laid the groundwork for realising the EU's vision outlined in the 2011 White Paper on transport.



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The project results have been distributed through several reports, conferences, seminars, workshops, posters and booklets as well as online, rendering the outcomes widely available to key players in the sector.

The project was coordinated by the Instituto Superior Tecnico, Lisbon, Portugal.

1 'High efficient and reliable arrangements for crossmodal transport'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Transport'.
http://cordis.europa.eu/marketplace > search > offers > 9618

Waterborne transport revolution

Important software and hardware advances are revolutionising propulsion systems and designs for waterborne vessels, making them much more cost effective, comfortable and environmentally friendly.

As global warming threatens the environment and fuel prices rise, the maritime industry is looking for ways to become more energy efficient by developing new propulsion concepts. Waterborne trade, such as via inland waterways, is also increasing rapidly, prompting a need for more environmentally friendly models for this type of transport.

An EU-funded project, Streamline[1], is developing improved propulsion configurations and integrating propeller systems with vessel-hull hydrodynamics to achieve major fuel savings.

One of the proposed technologies increases the efficiency of inland vessels by 15 % based on distributed thrust through multiple propulsors and novel 'Computational fluid dynamics' (CFD), also reducing noise and vibration compared to older systems. Another concept will deliver similar fuel savings for ocean-going vessels by



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dramatically increasing propeller diameter. The third radical concept is based on the motion of a whale's tail, offering a new way of propelling inland waterway ships that is dramatically more efficient than conventional screw-propeller systems.

Streamline is also automating optimisation of hull forms and designing free-form deformation techniques to further improve hulls and propellers, as well as developing a ship form that is free from intellectual property rights. Other advances envisioned include a new water-jet concept to give high-speed vessels a more efficient low-speed operating mode. All these hardware designs and upgrades are being coupled with software and computational advances that would streamline operation of the components even more.

Once the improvements and enhancements move from the laboratory to the commercial phase, the project could have a significant effect on reducing fuel consumption and polluting emissions. It would render waterborne transport much more attractive and cost effective while reducing noise and discomfort for crew and passengers. Overall efficiency gains from these new designs could even reach 30 %, helping to reform waterborne transport and usher in a new phase in the sector.

The project was coordinated by Rolls-Royce Power Engineering PLC in the United Kingdom.

1 'Strategic research for innovative marine propulsion concepts'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Transport'.
http://cordis.europa.eu/marketplace > search > offers > 9652

New and improved nuclear reactor prototype

EU-funded scientists are developing a prototype nuclear generator based on next-generation technologies. The reactor promises to be sustainable, safe and cost effective.

Producing electrical power from nuclear energy generates virtually no greenhouse gases. However, the fate of nuclear energy remains unclear largely due to safety concerns and the high costs associated with building new plants.

While modern water-cooled reactors are competitive and safe, their energy production is far from sustainable due to their inefficient use of fuel and generation of long-lived highly radioactive waste. Most new nuclear plants in the future will be evolutionary designs building on proven systems while incorporating the latest technological advances.

Among these are fast reactors, also called 'fast neutron reactors'.



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Fast reactors make more efficient use of their fuel, create waste that becomes harmless in centuries rather than hundreds of millennia, and use liquid metal coolants that are generally much safer than water-cooled reactors. 'Lead-cooled fast reactors' (LFRs) are a so-called Generation IV technology, one identified by the 'Generation IV International Forum' (GIF) as a next-generation nuclear-energy system.

European scientists sought to build on previous achievements in the ELSY[1] project, thanks to EU funding for the Leader[2] project.

Their goals were to design a 'European LFR' (ELFR) reference industrial-sized plant and produce a concept for a scaled demonstrator — the 'Advanced lead fast reactor European demonstrator' (ALFRED).

To date, the consortium has set up the ELFR reference configuration with extended energy efficiency and reduced release of fission products to the environment. A conceptual design has also been developed for ALFRED, with safety and cost analyses currently in progress.

Leader is expected to confirm that LFR technology is sustainable, using uranium fuel efficiently while reducing long-lived nuclear waste. If the project can also show that LFR technology is safe and cost effective, the public image of nuclear energy could get a facelift.

The project was coordinated by the Ansaldo Nucleare spa in Italy.

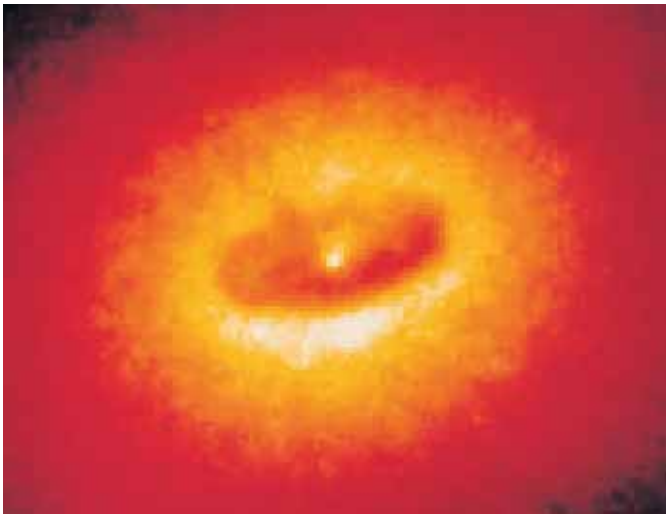
1 'European Lead System'.
2 'Lead-cooled European advanced demonstration reactor'.

Funded under the FP7 'Euratom research and training programme in the field of nuclear energy'.
http://cordis.europa.eu/marketplace > search > offers > 9635

ENERGY AND TRANSPORT

Simulating black hole phenomena

A joint European-US space mission, scheduled to launch in 2014, has been designed to study the phenomena of massive black holes. An EU-funded project is already developing methods to model, extract and analyse the information that will be obtained.



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The centres of most galaxies are believed to contain supermassive black holes that consume millions of stars which get trapped in their gravitational field. These events give off gravitational waves in the form of a compact binary system, called the 'Extreme mass-ratio inspiral' (EMRI).

The Laser Interferometer Space Antenna (LISA), a joint proposed mission between the European Space Agency (ESA) and the United States' National Aeronautics and Space Administration (NASA), aims to detect and measure low-frequency gravitational waves from EMRIs. Observations of EMRIs will have an important impact in astrophysics, cosmology and even fundamental physics.

The goal of the EU-funded Lisasimico[1] project was to develop techniques to model the dynamics of EMRIs and interpret their signals, determining the physical parameters of the system. The plan was to utilise these measurements in order to extract information on the science of EMRIs.

Scientists successfully developed a new technique to model the evolution of EMRIs and gain theoretical knowledge of the gravitational waveforms with a certain degree of precision. In addition, they made progress towards understanding the dynamics of EMRIs, while exploring possible astrophysical scenarios that can lead to inspirals inside the range of LISA's instruments.

The Lisasimico method of simulating gravitational waves is expected to provide invaluable information regarding different inspiral mechanisms. It should help to prepare scientists for LISA discoveries that will open a new window to exploration of the Universe.

The project was coordinated by the Consejo Superior de Investigaciones Cientificas, Instituto de Ciencias del Espacio in Spain.

1 'LISA gravitational wave astrophysics from simulations of inspirals of compact objects into massive black holes'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/marketplace > search > offers > 9609

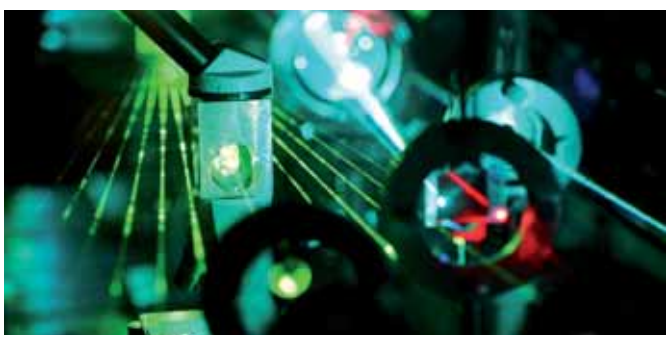
Novel laser technology for nuclear medicine

EU-funded European scientists investigated novel ion-acceleration mechanisms with important implications for imaging, nuclear medicine and nuclear physics.

Laser technology and its application to numerous problems of relevance to nuclear physics, nuclear medicine, radiography and imaging have developed significantly within the last several decades.

Intense, high-power lasers capable of delivering ultra-short pulses of radiation (on the order of femtoseconds, or one billion billionths of a millisecond) enable examination of the fundamental properties of high-intensity laser-matter interactions.

More recently, interest has developed in using such lasers for ion acceleration. However, the numerous mechanisms of ion acceleration depend greatly on laser and target parameters that have not been extensively studied.



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European scientists initiated the Laser-Ion Accelerato[1] project to investigate such mechanisms and provide practical recommendations for optimising ion yield.

Significant improvements to the ratio between laser-pulse intensity to noise intensity (temporal pulse contrast) enabled experiments to study new acceleration mechanisms such as 'Radiation pressure acceleration' (RPA).

Scientists also studied so-called 'Mass-limited targets' (MLTs), whose limited sizes lead to additional interactions of electrons with the laser pulse, thus enhancing ion energy.

Laser-Ion Accelerato yielded advanced understanding of ion-acceleration mechanisms with ultra-short pulse lasers. Project insights could have an important impact on nuclear physics, imaging and tabletop radio-nucleotide production for medical applications.

The project was coordinated by the Forshungsverbund Berlin E.V. in Germany.

1 'Optimal ion acceleration at the interaction of super-intense profiled laser pulse with mass limited targets'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/marketplace > search > offers > 9610

Shielding spacecraft from detrimental radiation

EU-funded scientists are developing novel materials to shield spacecraft electronics from damaging radiation. Reducing weight while maintaining safety should have an important impact on Europe's space-exploration programme.



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Space radiation from galactic cosmic rays and high-energy solar particles can cause short-circuits in electronic and communications equipment on Earth. Imagine what their unfiltered effects can be on spacecraft electronic systems and astronauts.

Conventional methods to protect spacecraft from cosmic and solar radiation involve thick shielding materials that attenuate the energy of charged particles as they pass through.

Aluminium is the material of choice as it provides not only shielding but structural strength. However, the thickness required for shielding exceeds that required for strength, resulting in excessive weight for the spacecraft and increased fuel requirements. Metal composites are lighter but their shielding effect is less.

European researchers are developing radiation-shielding strategies based on lightweight, safe and reliable composite materials, thanks to EU funding of the SIDER[1] project.

Investigators have chosen geostationary (GEO) and low-Earth orbits (LEOs) used for telecommunications and remote-sensing satellites as a starting point, given their tremendous commercial interest.

To date, the SIDER team has developed simulation tools for optimal configuration of radiation shielding taking into account primary particles incident on the shield and secondary particles responsible for damage behind the shield. Two different strategies for improving radiation-shielding behaviour are being studied: incorporation of nanomaterials and integration of metallic foils in the composite materials.

Manufacturing trials have been conducted yielding good-quality test samples. Irradiation facilities have been constructed and data from the first test are currently being analysed.

SIDER is expected to deliver novel shielding materials that significantly and safely reduce the weight of spacecraft. Such effects will reduce the cost of satellites or enable them to carry heavier payloads for the same price.

In the long term, technology provided by SIDER should have a significant impact on Europe's position in space exploration.

The project was coordinated by the Fundacion Tecnalia Research & Innovation in Spain.

1 'Radiation shielding of composite space enclosures'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Space'.
http://cordis.europa.eu/marketplace > search > offers > 9638

Integrating electric vehicles into power grids

Europe is paving the way for a transition from fossil fuels toward sustainable forms of energy. EU-funded scientists are developing technology and tools to facilitate integration of electric vehicles (EVs) into electricity grids.

With the increasing prevalence of electric or hybrid vehicles, electric power suppliers are facing a new challenge, namely integration of plug-in EVs into electricity grids.

'Distributed energy resources' (DERs) are a relatively new concept in the electric power industry that may play an important role in planning for future deployment of EVs. They are flexible and modular power-generation or storage units connected directly to the distribution network or to the network on the customer side.

Given that future DERs for EVs will be mobile, a concept not developed in previous projects, an operational plan must include consumers in charging mode and injectors of power when batteries are giving power back to the grid.

European researchers initiated the MERGE[1] project to develop

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EV control interfaces and a simulation suite to test them.

MERGE investigators are including two scenarios: charging stations for fleets of EVs (fast charging), and domestic or public individual charging points (slow charging).

Building on smart technology, or materials and systems capable of actively adapting to changes in relevant parameters, the MERGE team developed specifications for a user-friendly interface and smart-metering technology supporting EVs and utility and power providers.

In order to evaluate DERs for EV integration, investigators compiled extensive battery data and adapted several existing software tools for power systems analysis to include EV and grid-interface models. Cost issues and marketing concerns were also addressed through computational models, as were regulatory factors and business models for efficient integration of EVs.

Provision of the electric grid required for exploiting EVs and subsequent widespread adoption would decrease greenhouse gas emissions as well as traffic noise, given that electric cars are virtually silent. MERGE results have the potential to place the EU in a leading position regarding global export potential for such technology.

The project was coordinated by the Public Power Corporation S.A., Greece.

1 'Mobile energy resources in grids of electricity'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Energy'. http://cordis.europa.eu/marketplace > search > offers > 9650

Preparing for nuclear and terrorist incidents

In today's volatile world and globalised instability, the EU must prepare for the unlikely event of nuclear contamination, be it from a terrorist attack or a nuclear meltdown. Newly developed toolkits can help mitigate such a crisis much more effectively.

An increase in terrorist attacks and nuclear accidents in recent years has made it crucial for the European Union to develop contingency plans and propose tools to estimate radiation levels quickly. The EU-funded project Booster[1] is developing a novel prognostic toolkit to rapidly evaluate radiation exposure levels of casualties and classify urgent care needs.

A multinational team of experts related to the project has already identified user requirements and defined the overall architecture of the system. It is now designing the equipment, integrating sophisticated sensors, adapting the gamma camera necessary for the task and installing appropriate software. The technology features cutting-edge liquid scintillation methods, inductively coupled plasma mass spectrometry techniques, and laser-induced breakdown spectroscopy analysis.

The project is also conducting laboratory tests that involve immunogen activity, antibody generation, centrosome amplification and protein extraction among other biological processes and reactions to fine-tune the equipment's efficacy. Intense expert consultations and end-user feedback are helping refine the system even further, resulting in portable measurement devices with novel sensors that define safety perimeters, gather data and assess exposure.

In short, the technology will be able to identify radioactive gamma isotopes after a terrorist attack very quickly by testing body fluids or taking swabs. It would take under 20 minutes to identify irradiated people exposed to low or medium doses, assisting in prioritising urgent cases (triage) requiring the most care.

In this vein, one of the project's expected outcomes is the publication of the 'Triage, monitoring and treatment' (TMT) handbook for use by first responders. Another expected outcome is the development of a valuable knowledge database to assist in all related aspects.

In effect, Booster is successfully articulating a strategy to help restore confidence, safety and security in crises such as a dirty bomb attack or nuclear meltdown. The bio-dosimetric tools being developed will help first responders react extremely quickly and manage such a crisis valiantly.

The project was coordinated by the Commissariat à l'Energie Atomique et aux Energies Alternatives in France.



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1 'Bio-dosimetric tools for triage to responders'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Security'. http://cordis.europa.eu/marketplace > search > offers > 9621



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Interview: keeping the peace between Chilean wild cats and landowners

Probably one of the world's lesser-known felids, the kodkod cat is classified as a vulnerable species by the International Union for Conservation of Nature. It is currently under threat from deforestation, the spread of agriculture, superstition and its taste for domestic poultry.

Initiated in 2010 under the FP7 People programme, the Kodkod[1] project aims to identify the conservation needs of the kodkod cat (*Leopardus guigna*) in the Chilean temperate rainforest. Not only are the project results expected to increase knowledge of this rare and mysterious species, but they should also provide for more effective conservation strategies based on a better understanding of the perspective of indigenous populations. Interviewed by *research*eu results magazine*, Dr Elke Schüttler, Research Fellow at Helmholtz Centre for Environmental Research, explains the aims of the project, its unique approach and its expected impact on future conservation strategies for the Chilean wild cat and other endangered species.

What are the objectives of the Kodkod project?

It is a scientific conservation project focusing on a rare South American wild cat — the kodkod or guiña — which has received little attention compared to more common and charismatic felids. Wild cats are carnivores requiring large areas over which to forage. This makes them vulnerable to fragmentation and creates conflict with humans over livestock. Weighing one to two kilogrammes, the kodkod cat is the smallest South American felid. It inhabits the highly threatened southern temperate rainforests of Southern Chile and Argentina and occasionally attacks poultry in agricultural areas. Landowners often retaliate by killing the cats, making research into their conservation a multidimensional challenge requiring an integrative socio-ecological approach.

On the one hand, we used classical methods such as radio-telemetry and camera-trapping to assess the cats' use of of forest remnants and other habitats. On the other hand, we interviewed landowners and their children about their tolerance towards the chicken-killing cat. In the final project phase, this will allow us to superimpose two different maps: the ecological landscape from the cats' perspective and the tolerance landscape from the landowners' viewpoint. In this way we can create different scenarios for the kodkod's future, to be discussed in conservation round tables with stakeholders.

What is new or innovative about this project and your methodology?

We tried to integrate the vision of indigenous Mapuche people into our bio-social research. Researchers call this ethnozoology, which is still a relatively novel approach in conservation science. Indigenous perspectives on biological diversity often differ from the more globally motivated modern conservation approaches. Therefore it is important to better understand the spiritual and cultural relationships between local people and wild animals so as to move towards more integrative and responsible conservation strategies.

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© kodkod project

Dr Elke Schüttler using telemetry equipment

In this project we asked Mapuche elders if the kodkod appeared in legends, places or surnames, or if it was used in ceremonies. Such information might also be used in bio-cultural education material such as bilingual books for children with stories about endangered wildlife. For example, kodkod in Mapudungun might come from '*ko*', which means 'enter something', probably referring to the guiña's presence in hen houses.

What difficulties did you encounter and how did you solve them?

It was quite difficult to study such an elusive and rare animal as the kodkod cat directly via radio-telemetry. There are only a few animals, and being really intelligent they would not enter a trap right away. This meant we had to set up traps during the whole two-year fieldwork period instead of over several months as was initially planned. We only managed to trap an adequate number of cats with the help of many hands and creative ideas to attract them, such as CDs hung in trees to catch their attention or varied menus of meat accompanied with tasty odours. In total, five graduate students and eight volunteers participated in different aspects of the Kodkod project, and I am happy that we managed to get additional funding to support their involvement.

What are the concrete results from the research so far?

Based on telemetry data, we can see that kodkod cats still inhabit significantly modified landscapes, but also that they need forest corridors as stepping stones to connect the remnants of forest. Such corridors are often associated with rivers and could be promoted as ecologically important habitats among the landowners. Interviews revealed that knowledge of this species is poor and that kodkod cats occupy quite a mystic place in people's minds, such as being a sign of bad luck. This is probably linked to this felid's mysterious way of life.

We also found that greater tolerance can be achieved by enhancing the knowledge about how rare this species is and its role in controlling rodent pests. For the younger generation, innovative outreach material has already been developed by a team of teachers, designers and biologists. A video using kodkod puppets has been distributed among local schools, while the DVD 'Searching for an opportunity' tells the story of kodkod cat Leopolda's life in the forest and the challenges she must overcome to find food for her daughter. This DVD also insists on the benefits brought to the humans by kodkod cats, for example by showing Leopolda as she succeeds in catching some of the mice that are an important reservoir host of the deadly *Hantavirus* pulmonary syndrome for humans.

What are the next steps in the project?

I have just finished the field phase in Chile and am back in Germany now. In the last year of the project we must publish the data, so most of the work will be done in the office. However, as soon as we have the final results, they will be presented in the study area. The idea is to discuss the results in conservation round tables with local stakeholders, such as local authorities, Mapuche indigenous communities, rural agricultural associations and NGOs. This should lead to land-use recommendations for private landowners.

What do you hope the project results can achieve?

I hope that our work will contribute to improving the coexistence of this beautiful felid species with the people in its neighbourhood. Our results will shed light on both the habitat requirements of this elusive and little-known species and on how it is perceived among landowners, who have the final word on the availability of adequate habitat. Understanding both perspectives is a first step towards long-term conservation strategies , not only for this felid species, but in general for most of our planet's biodiversity.

Can and will your methodology be extended to other species?

Yes, the interdisciplinary approach of this project can be used for other species, particularly for carnivores which often involve human-wildlife conflicts. The project can probably be applied to other endangered small felid species as an example of how biologists, veterinarians, teachers and social scientists can work together on the same problem, each of them contributing a piece of the jigsaw to the whole puzzle.

1 'Forecasting conservation needs for endangered fauna: integrating landscape ecology and ethnoecology to predict habitat quality for the kodkod cat (*Leopardus guigna*) in the Chilean temperate rainforest'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
For further information see:
http://www.ufz.de/index.php?en=11382

Scientists put spotlight on marine biodiversity in Europe

Scientists from 16 countries have kicked off a new EU-funded project that explores marine biodiversity and the environmental status of seas in Europe. Devotes[1] has secured almost EUR 9 million in funding under the Environment theme of the Seventh Framework Programme (FP7).

Led by the Spanish Marine and Food Technological Centre AZTI-Tecnalia, more than 250 scientists from 23 research centres in the EU, Asia and North America are working together to improve our understanding of how marine biodiversity is affected by human activities and global changes. Under the plan, the team will examine existing indicators and develop new ones in order to evaluate biodiversity in a harmonised way. The targets are European regional seas, namely the Mediterranean, Black and Baltic seas, and the Atlantic Ocean.

From 2012 to 2016, the Devotes consortium will develop and validate sophisticated tools that relate to ecological theory and assessment in an integrated way. Examples of these tools include

remote-sensing, modelling and genomics.

The objective of the project is to improve knowledge of the changes in ecosystems and biodiversity. Information and products obtained by the team will provide them with the means to recommend to European decision-makers various measures that contribute to the sustainable use of seas and marine resources. The Devotes partners say the measures will take into account all stakeholders related to the marine environment, including governments, regional sea conventions, sectors and industries like maritime transport, fishing and aquaculture.

'It is of strategic importance to know the main human pressures affecting the marine environment and biodiversity, because this knowledge is necessary for their protection,' said project coordinator Dr Ángel Borja, principal investigator at the Marine Research Division at AZTI-Tecnalia. 'The project will enable European policies that promote the sustainable development and environmental status assessment of our seas, and will reinforce the cooperation among Member States and regional seas, both at EU level and internationally.'

The Devotes project is associated with the Marine Strategy Framework Directive (Directive 2008/56/EC), which targets marine environment protection and conservation. In order to reach their target within the next eight years, the EU Member States will use what scientific knowledge is available to evaluate marine environment protection and conservation along with the effect of human activities, such as changes in food webs, marine eutrophication, hydrography and introduction of alien species. Socio-economic factors should be considered as well.



© Biodiversidad Marina

Ultimately, the project will produce the information that EU Member States need to follow through for conserving marine biodiversity.

The project is coordinated by Fundacion Azti in Spain.

1 'Development of innovative tools for understanding marine biodiversity and assessing good environmental status'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Environment'.
http://cordis.europa.eu/news > search > 35236

Forest biodiversity in the context of climate change

The task of forest managers is to outwit the elements by introducing and growing tree species that will benefit from dynamic environmental stresses and changes. An EU-funded study is amassing data to aid foresters deal with the possible effects of climate change on forest productivity.

Research has suggested that the positive effects of increasing temperature and carbon dioxide (CO_2) on forest productivity may be outweighed by climatic events such as severe drought and consequent die-back. However, the overall response of the whole tree community has to be taken into account. This includes factors such as biotic interactions like shifts in dominance, symbiosis and competition.

Species diversity has been cited as one of the main drivers behind increased productivity, but significant results are harder to come by in the complexity of a forest ecosystem. To equip forest managers with tools to evaluate forest diversity, the Baccara[1] project developed a three-dimensional (3D) risk-assessment model.

Linking climate change, functional diversity and productivity, the researchers predicted the risk of forestry loss. Reduction in production is considered to be a function of the hazard of climate change and vulnerability according to its diversity.



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Project results from an exhaustive analysis of forest inventories show rapid distribution shifts in the altitude optimum of tree species. This indicates a significant impact on tree distribution due to climate change.

Data also suggests that competition between trees and interaction between trees and insects and fungi are critical factors in climate change response. Knowledge concerning complex interactions of this nature is crucial as pest and pathogen damage in the forest increases with drought, for example, but not for all species.

Forest species inventories indicate that on average mixed forests are twice as productive as single species stands, although this could be due to diverse forests having a larger basal area than pure stands. Simulations using tree growth models suggest that tree species' richness and functional diversity promote productivity in temperate forests. Baccara researchers stress that a lot more analysis is required to fully explain the

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relationship between species diversity and production.

In future, Baccara outcomes will be collated for a multi-criteria decision analysis (MCDA) tool. At stand level, managers will be able to choose either the pure option or mixed options to reach the best compromise for improving productivity while reducing risks and costs to a minimum.

Baccara guidelines will help forest managers decide which species to keep and what 'to chop' in various climate change situations. Project information will also make it possible for managers to plan in advance which pests they will need to control.

The project was coordinated by the Institut National de la Recherche Agronomique in France.

1 'Biodiversity and climate change, a risk analysis'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Food, agriculture and fisheries, and biotechnology'.
http://cordis.europa.eu/marketplace > search > offers > 10072

In Darwin's footsteps: pig DNA sheds light on evolution and selection

The pig and its cousin the wild boar share a lot with humans. They are world travellers and are easy to seduce (with food). But there is more: a new analysis of their DNA reveals some unexpected and potentially beneficial similarities with humans, further supporting the pig as a valuable biomedical model.



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Prof. Martien Groenen — who received a EUR 2.5 million Advanced Grant from the European Research Council (ERC) in 2009 — conducted this unprecedented genomic study with scientists from 12 countries. Prof. Groenen also analysed pigs' DNA evolution since humans started to domesticate these animals some 10 000 years ago. The latest analysis was conducted in collaboration with another ERC Advanced Grantee, Prof. Leif Andersson. Both studies, funded under the Selsweep[1] and Bateson[2] projects respectively, have been featured in two renowned scientific journals: *Nature* and the *Proceedings of the National Academy of Sciences (PNAS).*

'These two research studies demonstrate the benefits of basic genomic research on agricultural animals and their closest living relatives. The new analysis has important implications for agriculture, and also contributes to our understanding of evolution and to the advancement of human medicine,' explains ERC grantee Prof. Groenen from the University of Wageningen, in the Netherlands.

Published in *Nature*, the first study focuses on the changes that have accumulated in the genome of the pig during its speciation in Eurasia and its subsequent domestication and selection by humans. An international team of researchers compared the genome of a common farm pig, *Sus scrofa domesticus*, with those of ten wild boars — all from different parts of Europe and Asia. They also analysed the pig genome in parallel with those of the human, mouse, dog, horse and cow. Comparisons of Asian and European wild boars revealed significant genetic differences, which are the result of their separating from one another roughly 1 million years ago.

Some gene families in the pig are undergoing relatively fast evolution, with immune genes and olfactory genes quickly expanding. The pig has more unique olfactory genes than humans, mice or dogs, the researchers report. While pigs can smell a world of things humans and many other animals cannot (e.g. truffles), their sense of taste is somewhat impaired.

The new analysis also supports the use of the pig as a model in studies of human diseases such as obesity, diabetes, dyslexia, Parkinson's and Alzheimer's. In total, the team found 112 positions where the porcine protein has the same amino acid as that implicated in a disease in humans. 'By also sequencing the genomes of another 48 pigs, we identified many more gene variants implicated in human disease, further supporting the pig as a valuable biomedical model,' adds Prof. Groenen.

How the European domestic pig became longer and got its white colour

The study published in *PNAS* analyses more specifically what genes and regions of the porcine genome have been changed during the 10 000 years of this animal's domestication and selection. The European team of researchers identified three loci that affect one of the most striking morphological changes in the domestic pig — the elongation of the back and the increased number of vertebrae. This important change had already been observed and described by Charles Darwin in his book "The variation of animals and plants under domestication".

The researchers have identified three genes that are strong candidates for the observed changes in the European domestic pig. Interestingly, two of these genes have been associated with variation in size in other species, including humans. The researchers also showed that structural variation of certain genes is more common than is usually thought. They identified a complex pattern resulting in a variety of coat colours, including the dominant white, patched and belted phenotypes (physical characteristics).

'The gene variant causing dominant white colour in pigs is the most striking example of an emerging picture that structural variants (duplications, deletions and inversions) have contributed significantly to phenotypic evolution of domestic animals,' concludes ERC grantee Prof. Andersson from Uppsala University, Sweden.

1 'Molecular characterization of genetic factors in the pig under selection during speciation, domestication and breeding', coordinated by Wageningen Universiteit in the Netherlands.
2 'Dissecting genotype-phenotype relationships using high-throughput genomics and carefully selected study populations', coordinated by Uppsala Universitet in Sweden.

Funded under the FP7 specific programme 'Ideas'.
http://erc.europa.eu > Project and results > Success Stories

Protecting biodiversity through better science–policy connection

The importance of biodiversity and its contributions to human well-being call for a dynamic approach linking related science and policy. A team of European researchers has set out to achieve exactly this.

Anthropogenic drivers such as climate change continue to impact biodiversity, the loss of which affects ecosystem services that offer a wealth of benefits for all living beings. A shift in policy is needed to address these drivers and encourage behavioural changes supporting the conservation of biodiversity and its sustainable use.

Toward this aim, the Spiral[1] project is working to enhance the connectivity between research on biodiversity and sustainability-related policy-making. To realise its objectives, the EU-funded initiative is promoting advanced interdisciplinary research on science-policy interfaces, focusing on sustainability governance at practical, theoretical and methodological levels. Such an approach aims to support implementation and operation of 'real-life' designs that seek to interface the two areas.

To improve the governance of biodiversity, a deeper understanding is needed of problem areas in the science–policy interface. A set of project objectives thus includes in-depth examination of how biodiversity research informs policy-making processes and vice versa, and assesses challenges presented by existing biodiversity science–policy interfaces.

Expanding on and addressing such issues will directly contribute to enhancing biodiversity research and governance. Furthermore, Spiral activities will offer opportunities for capacity building and networking, and will result in a series of physical products such as handbooks, scientific papers and online tools for accessing and sharing information. These will prove invaluable to scientists, policy-makers and other stakeholders eager to employ better practices in their respective domains.

Beyond boosting research in sustainable development to the benefit of human well-being, project outcomes will viably support and contribute to the policy-guiding principles and goals of the EU's renewed Sustainable Development Strategy.

The project is coordinated by the Natural Environment Research Council in the United Kingdom.

1 'Science-policy interfaces for biodiversity: research, action, and learning'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Environment'.
http://cordis.europa.eu/marketplace > search > offers > 10014



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ENVIRONMENT AND SOCIETY

Biodiversity standards unified

The establishment of a new European biodiversity observation network will support environmental protection and assist in creating worldwide standards for documenting ecosystems and species.



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With man's encroachment on ecosystems and the effects of climate change, the world's biodiversity urgently needs better monitoring mechanisms to help preserve nature's balance. In response, the EU-funded project EBONE[1] designed and tested a powerful new terrestrial observation system to achieve the desired level of monitoring.

The project envisioned a low-cost system of biodiversity data collection to compare European statistics with that of other areas of the world. It worked on developing a common strategy and standardisation of data collection in Europe with a view to spreading this unified approach worldwide.

Some of the project's most important achievements include progress on implementing the Convention on Biological Diversity (CBD) and formulating trend-revealing biodiversity assessment indicators. EBONE also published an array of valuable reports, a field handbook and protocols on biodiversity, supported by statistical work, surveys and literature reviews. Topics addressed include articulation of habitat categories, data on species, remote-sensing, and achieved faster land mapping.

EBONE organised a major project conference in Belgium and a workshop in Israel to publicise a host of recommendations and protocols on many topics, such as identifying and reviewing new life forms. Thanks to the project team's efforts, research will enable the development of key indicators to guide policy-makers in protecting ecosystems and species, as well as tools to manage, forecast and validate policy options.

The project was coordinated by Stichting Dienst Landbouwkundig Onderzoek (DLO) in the Netherlands.

1 'European biodiversity observation network; a project to design and test a biodiversity observation system integrated in time and space'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Environment'.
http://cordis.europa.eu/marketplace > search > offers > 9896

An aquaculture innovation to boost quality fish production

The market for fish is growing at an exponential rate. However, European catches in particular have dropped in recent years and the current supply of fish is not enough to meet market demand. Furthermore, as a result of near depletion of certain European fishery stocks, reduced annual catch quotas, and reduced fishing fleets, EU Member States are becoming increasingly dependent on imports from third countries.

ClosedFishCage[1] is a project aimed at alleviating the depletion of fish stocks. The EUR 1.1 million Seventh Research Framework Programme (FP7)-funded project will not only improve the competitiveness of SMEs in the aquaculture sector but will also safeguard the potential production of good quality fish, in sufficient quantities and at competitive prices.



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The ClosedFishCage project has focused on the development of a closed, escape-proof, constant-volume, sea-based cage for fish farming. Among the project's innovative elements are a highly durable and flexible polymer plastic net pen, a predator guard, a control system, and the easy set-up and replacement of damaged cage parts.

'Our solution is in essence an environmentally friendly closed cage for fish farming,' says Alexander Solbakken, managing director of lead company Plastsveis AS which specialises in aquaculture technology. 'The cage is made from recyclable material. It ensures continued supply of water and minimises fish farm production risks, especially those posed by predators like wild fish or seals and parasites such as sea lice.'

'The technological solutions adopted for the cage have all the benefits of land-based fish farming while taking advantage of the cost efficiency of sea-based fish farming,' he adds.

These cost savings are estimated at up to EUR 25 000 per installation due to the fact that open net sea cages do not require chemical-based cleaning methods. Moreover, thousands of tonnes of organic waste could be reused for the production of biogas.

Results have been impressive. The ClosedFishCage team produced 100 salmon in a first non-commercial prototype over a period of six months. Their growth was similar to that of other salmon kept in open cages in the same farm at the same time of the year. However, in order to fight sea-lice infestation, the open cages had to be cleaned on a regular basis. The closed cages did not require any such maintenance, which is the main reason why ClosedFishCage 'is expected to be economically advantageous.'

The consortium is coordinated by Norwegian Plastsveis and supported by specialist maritime companies and non-profit institutions in Norway, Italy, Denmark and Spain. The project is set to start work on developing a commercial prototype for further technological and biological testing. In fact, it has already received a five-year research licence from the Norwegian government to hold a 780-tonne fish stock.

Solbakken estimates that ClosedFishCage will enter the market in 2015 and is very upbeat about it. 'The potential is huge,' he says. 'The Norwegian market alone represents approximately 65 % of the total production of Atlantic salmon in the world. By 2015, we want to have developed bigger closed constructions that are built on the same principles as the test model, which are optimal strength, flotation and water exchange.'

The project is coordinated by Plastsveis AS in Norway.

1 'Development of an innovative, cost-effective environmentally friendly closed cage for sea-based fish farming'.

Funded under the FP7 programme theme 'Research for the benefit of SMEs'. http://ec.europa.eu/research/infocentre > search > offers > 27814

Tree genetics improve breeding strategies

To deliver high-quality wood-related products, foresters used to rely only on a tree's appearance. A European consortium is turning to genetics to unveil traits of adaptive and economic interest.

The increasing pressure on forest ecosystems imposed by climate change and human activity necessitates a thorough understanding of forest tree biology and genetics. However, despite advances in genome research, complex traits such as wood production, which integrate various physiological functions, are difficult to dissect.

The EU-funded Noveltree[1] project was designed to genetically improve the composition and characteristics of forest products by enabling the selection of the most appropriate traits through careful breeding planning.

The genetic variation of tree populations from European forests as well as from controlled environments was explored to define which traits were responsible for tree responses to changes in the environment and climate. Special emphasis was put on assessing water-use efficiency and wood's physical and chemical properties.

Through genome research, scientists discovered genomic regions involved in the genetic control of both adaptive and productivity traits. By sequencing part or complete genomes, scientists identified several 'Single nucleotide polymorphisms' (SNPs) in genes that confer desirable traits.

Such morphological and physiological traits were selected for their contribution to pest tolerance, sustainable biomass production and wood properties. All phenotypic and molecular information was incorporated into innovative breeding tools that allowed for earlier genetic evaluation, increased accuracy in genetic selection, and better monitoring of genetic diversity across generations. This was further facilitated through software and model simulators for evaluating breeding strategies and novel techniques, as well as for choosing the best tree breeding practices.

Collectively, the Noveltree findings have deepened our understanding of the nature and origin of genetic variation for important adaptive traits, increased growth and wood yield. Implementation of the project's recommendations can help Europe's forestry sector meet related consumer demands and achieve profitable forest management.

The project was coordinated by the Institut National de la Recherche Agronomique in France.



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1 'Novel tree breeding strategies'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Food, agriculture and fisheries, and biotechnology'. http://cordis.europa.eu/marketplace > search > offers > 9983

ENVIRONMENT AND SOCIETY

Europeans aim to provide better access to biodiversity data

The Nordic states have entered into an agreement to drive and establish a Nordic E-Science for Biodiversity and Ecosystem Research infrastructure. Called LifeWatch[1], this European initiative has emerged under the framework of the European Strategy Forum on Research Infrastructures (ESFRI).



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LifeWatch seeks to provide improved access to biodiversity data to benefit environmental research. The majority of biodiversity data are held by research institutions, environmental management institutions and non-governmental organisations (NGOs). By giving the public better access, scientific biodiversity and ecosystem research will get the boost it needs.

One hot topic is the sustainable management of Earth's biodiversity and ecosystem services. LifeWatch will effectively improve our understanding of ecosystem functions and enable us to make predictions and simulations, including environmental interactions and species distribution, in an ever-changing world. The work being carried out by the LifeWatch team will benefit local and global policy-makers.

'The Nordic countries have great potential to create a joint highway for biodiversity informatics, enabling cutting-edge research and models for sustainable use of our natural resources,' said Professor Ulf Gärdenfors, manager of the Swedish team of LifeWatch, from the Swedish Species Information Centre of the Swedish University of Agricultural Sciences (SLU).

Sweden was the first of four Nordic states to begin building the national research infrastructure for biodiversity via the LifeWatch initiative. SLU is working with a number of universities and institutions in the country, and Denmark, Finland and Norway are quickly following suit.

The members of the Nordic LifeWatch team officially started working together in November 2012. Ultimately, the team will identify the scientific potential of a common Nordic infrastructure based on inventories of user needs, current data repositories and limitations related to data-sharing in general.

Their findings are expected to lead to the development of strategies and a proposal for funding a Nordic LifeWatch construction phase in cooperation with diverse groups, including research councils, scientific communities and government ministries.

Under ESFRI, LifeWatch will tackle key issues in species observation and citizen science; sensors; species traits; biodiversity organisations; ecosystem services and auxiliary data (Earth observation). Experts are currently working on launching a joint European LifeWatch consortium, with Spanish, Italian and Dutch researchers keen to participate.

The project is coordinated by the Universiteit van Amsterdam in the Netherlands.

1 'Life Watch'.

Funded under the FP7 specific programme 'Capacities'.
http://cordis.europa.eu/news > search > 35290

Protecting our honey bees

The past decade has witnessed the dramatic loss of honey-bee colonies. An EU-funded project is examining the hypothesis that interactions between several pathogens were the main drivers of colony death.

The interdisciplinary BEE DOC[1] project is enhancing knowledge of pests and diseases, including colony collapse disorder. This is being achieved by harnessing European expertise in the fields of pathology, chemistry, genetics and agriculture.

Researchers are studying two model parasites in the form of Nosema and Varroa mites and three model viruses — Deformed Wing Virus, Black Queen Cell Virus and Israel Acute Paralysis Virus. In addition, two model pesticides, thiacloprid and t-fluvalinate, have been examined to determine how their interaction with the parasites and viruses affected individual bees and colonies in different areas of Europe.

The consortium has conducted state-of-the-art genetic analysis to uncover the relationship between host-pathogen-pesticide and to identify new genes for disease resistance. Scientists



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focused on long-term exposure to pesticides and examined how bee-keeping practices affect colony health. In addition, BEE DOC has developed new diagnostic screening techniques and methods for disease prevention using new treatments and tools for selecting resistant bees.

Links to ongoing national and international colony health monitoring and research programmes in Europe and North and South America have enabled the project's results to be disseminated to bee-keepers around the world. The aim is to develop new therapies and tools for promoting disease resistance in appropriate strategies for combating colony collapse disorder.

The initiative could also affect the setting of new limits for the concentration of pesticides used in agriculture and for chemotherapies used in treating honeybee colonies.

Thanks to BEE DOC, honey bees will be better protected from colony collapse and enabled to carry out their vital work of pollination, upon which much of our agriculture and food production depends.

The project was coordinated by Martin-Luther-Universitaet Halle-Wittenberg in Germany.

1 'Bees in Europe and the decline of honey bee colonies'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Food, agriculture and fisheries, and biotechnology'.
http://cordis.europa.eu/marketplace > search > offers > 9968

Africa, as seen from above

By empowering Africa to observe its varied landscape and climate through the latest satellite technology, the EU will help African nations to exploit valuable environmental data.

Africa can help advance development if it has comprehensive Earth Observation (EO) tools in its disposal, particularly with the support of the EU's Global Monitoring for Environment and Security (GMES) programme. In this context, the EU-funded project SAGA-EO[1] conducted a feasibility study to design and assess EO infrastructure and applications across the continent. It aimed to train national actors in exploiting EO data to manage the environment and natural resources.

The project sought to establish networks of actors in Congo, Côte d'Ivoire, Ghana, Mozambique and Senegal in order to coordinate with GMES and organise EO services. Each national network of accountable users would have a local scope, rules and legal stature to pursue specific goals that would lead to a number of benefits.

Project advantages include improved economies of scale in EO data supply and capacity-building, as well as increased synergy between different sectors through the sharing of EO-based data. SAGA-EO also saw the actors as a means of safeguarding the interests of the African national EO user network and following up on policy implementation.

By strengthening education and research actors within the African national EO user network, the project is encouraging knowledge, sustainability and autonomy of the countries involved. It is also laying the groundwork for Africa to address important topics concerning its livelihood, such as global climate change, which can impact agriculture, navigation, biodiversity and general sustainability.

SAGA-EO identified a major theme for the EO network to work on in each country. In Congo, it proposed the impact of water shortage on river navigation, while in Côte d'Ivoire it aimed to assess the agricultural impact on forest cover. In Ghana, the project's priority was monitoring coastal erosion, and in Mozambique it pinpointed a need to work on flood forecasting. Lastly, in Senegal the project team proposed that the local EO network focused on food security.

This horizontal model of cooperation, which creates a national network of EO data users touching on different disciplines and sectors, is slated to help these five nations address key issues that are hampering development. With varied expertise revolving around five different themes, the rest of Africa could benefit from this pilot project and help advance the world's second most populous continent in important ways.

The project is coordinated by Thales Alenia Space in France.



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1 'Support action to GMES-Africa on Earth observation'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Space'.
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IT AND TELECOMMUNICATIONS



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Beam me to my meeting!

Forget about crackly lines or blurry webcams. Video conferencing has just got a whole lot better. By combining robotics, video and a host of other sensor and display technologies, European scientists can now virtually 'beam' you to locations on the other side of the globe. It may sound like science fiction, but this new approach can make it feel like you are really 'there'!

Teleconferences, video conferencing and web exchanges have become the norm for most multinational businesses. But nobody really likes them; nothing beats meeting people face to face.

'When we meet people in the flesh we can pick up on subtle cues — facial expressions, quirks, who is looking at who,' explains Stephen Dunne from Starlab in Spain. 'There is so much non-verbal communication that you miss, even with the highest-quality video conferencing technology. You can't shake hands or decide to look around the room, for example.'

Working in an EU-funded research project, scientists from across Europe have now combined a set of digital technologies that could effectively transport someone into a meeting room on the other side of the world. For the first time ever, people have been able to shake hands on a deal, separated by thousands of miles.

Of course, there is no teleportation involved, but the Beaming[1] project uses immersive virtual-reality techniques and technologies to make you feel like you are actually somewhere else. In that 'somewhere else', you are embodied by your avatar — a real-life robot, for example — which becomes your eyes, ears and mouth.

As the Beaming 'traveller' you are rigged up with multiple sensors and have your head covered in a full head-mounted display. Yet that display means you see and hear what your robotic-self can see through its video-camera eyes and microphone ears — and you can respond just as you would if you were really there. If you move your head, the robot's head moves the same way; if you speak, the robot talks with your voice. Movement sensors on your arms detect how they move and the robot's arms match these actions. And if someone touches the robot's hands, this pressure is relayed back to pressure pads on your hand.

The technology has been demonstrated in a groundbreaking interview between a project scientist in Spain and a BBC journalist in University College London. The journalist was able to interview the scientist and even 'high five' them at the end of the demonstration.

Today's technology, tomorrow's market?

'What we have achieved here is a real demonstration of what can be done with the technologies we have available to us today,' remarks Mr Dunne, project manager for Beaming. 'We took "off-the-shelf" products and combined them in this unusual way. This is not a breakthrough in technology development, but is certainly a breakthrough in demonstrating the powerful ways in which media can be networked to achieve amazing things.'

One of the biggest tasks for the Beaming partners has been to develop a framework data architecture for the system. This defines how all the visual, audio, motion and pressure data are packaged and transmitted between the traveller and their remote environment. It also establishes how the 3D model of the remote location is generated for the 'traveller' to create a strong sense of presence for them.

'The purpose of the framework is to make Beaming entirely independent of the hardware or software involved,' explains Mr Dunne. 'You'll be able to use any robot or any sensor, for example. We have also tried to define the minimum amount of data you need but still make the Beaming experience fully immersive.'

Emotional clues

Although head-mounted displays, pressure pads and 3D graphical interfaces can give you a real sense of being elsewhere, what is it like for people at the other end, those sitting around a table,

for example, having to interact with your avatar? Talking to a robot who talks like you could be quite unnerving!

'It was important for us to make the interaction as natural as possible. Whether people are interacting with a robot or some kind of virtual avatar, we want the experience to feel natural and not get in the way of normal communication,' says Mr Dunne.

One simple improvement was to give the robot a more expressive head. The team replaced its mechanical eyes and mouth with an LCD display. 'We used graphics for the eyes and mouth; they look much more natural. People seem to relax more if they can look a robot in the eye and the eyes look right. It is easier to forget that they are dealing with a machine!' says Mr Dunne.

Research still continues to investigate how data about the Beaming traveller's physiological and emotional state could be recorded and relayed to the people in the remote location. The project has experimented to see how the traveller's heart rate, facial expressions and even brainwaves could be clues to their emotional state. So far, technology can be trained to use these signals to recognise basic emotional states, for example to differentiate between relaxed and stress. The challenge now is to work out how to communicate their signals to everyone else through the avatar.

Is travel a thing of the past?

'We are not claiming that Beaming will revolutionise meetings or save the world millions of tonnes of carbon dioxide because people won't need to travel anymore,' Mr Dunne stresses, 'but we do think this idea of "beaming" individuals to locations where they can move and interact through a robot could really work for some very specific applications initially.'

'It is ideal if you want to transport a person with specific skills or knowledge to another location,' Mr Dunne continues. 'It gives that person total physical immersion in their remote location. They can touch and interact with their remote environment. We think it might work for top surgeons who could "beam" into operating theatres all over the world and share their expertise and knowledge, even perform operations.

'As a project, our inspiration was strictly to demonstrate that this kind of virtual travel and interaction could be done. Now it is the job of individual partners to translate this into the real world and real products. We are moving from the realm of scientific curiosity and looking at services we could offer.'

The Beaming project received EUR 9.2 million (of a total EUR 12.4 million project budget) in research funding under the EU's Seventh Framework Programme (FP7).

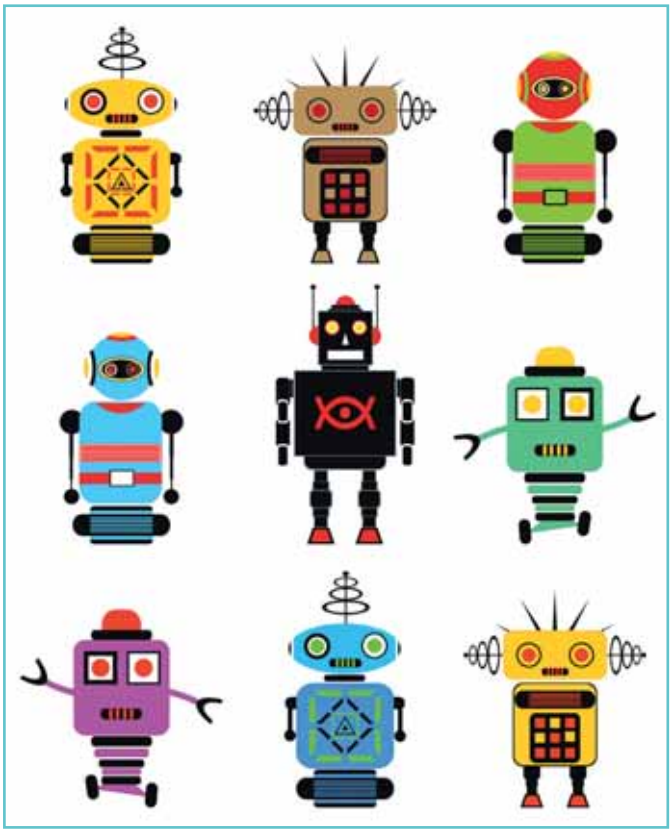
The project was coordinated by Starlab in Spain.

1 'Beaming through augmented media for natural networked gatherings'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Information and communication technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9642

A micro-sized robot wins the race

EU funding enabled European researchers to develop a world-class miniature robot with a variety of potential applications in robotics and micro-manufacturing.



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'Adaptronics' is a state-of-the-art multidisciplinary field focused on the development of mechano-electrical systems capable of adaptive control, i.e. self-adapting in response to changes in environmental conditions.

Micro-robotics and micro-manufacturing systems for assembling microscopic components are among the most promising applications of adaptronics. Adaptive systems have many complex components and functions.

Smart (active) materials — such as those that respond to a change in pressure with a change in electrical output and vice versa (piezoelectric materials) — are often at the heart of adaptive devices. They also include sensors to determine changes in certain parameters and actuators to affect an appropriate response. Finally, they require control technology to coordinate the working of all the parts together.

Such systems have very strict performance requirements including nanometre resolution and millisecond response time. The fast, precise, miniature sensors required for micro-robotic applications are currently lacking. European scientists sought to fill this gap with the EU-funded Micropads[1] project.

Micropads focused on developing centimetre or millimetre-scale active structures that integrated actuating and sensing functions together with embedded control technology on the same piezoelectric material.

Scientists first researched new materials and processing techniques. They identified a new generation of piezoelectric materials — 'Lead magnesium niobate-lead titanate crystals' (PMN-PT) — in combination with silicon, as the most promising for developing high-performance microsystems.

The consortium then designed innovative micro-actuators and micro-grippers based on a combination of thermal and piezoelectric principles (so-called hybrid thermopiezoelectric

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actuators) for which a patent is pending.

Development of embedded measurement systems for the piezoelectric micro-actuators enabled use of the piezoelectric system as both actuator and sensor with measurement and control embedded in one electronic board. The systems facilitated better signals at lower cost and requiring a much smaller space.

Building on the new technology, the Micropads consortium created a mobile micro-robot. The amazing device took first place at the prestigious 'Institute of Electrical and Electronics Engineers International Conference on Robotics and Automation' (IEEE ICRA) and set a world record in a robotic race.

The Micropads consortium thus developed cutting-edge adaptronics with virtually limitless applications.

The project was coordinated by the Université de Franch-Comté in France.

1 'New micro-robotic systems featuring piezoelectric adaptive microstructures for sensing and actuating, with associated embedded control'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/marketplace > search > offers > 9605

Towards the 'Future Internet', experiment by experiment

You may not notice as you surf the web, but the internet is a clunky thing, built on a mixed bag of technologies, some of them decades old. Upgrading such a vast network is no easy task, although the same trial-and-error approach that led to the internet's creation now promises to keep it expanding and improving in the future, thanks in part to EU-funded research.

'Experimentally driven research is now seen as being very important in many fields. It led to the creation of the internet and it will be very important for the Future Internet,' argues Serge Fdida, a professor in the network and performance group at University Pierre et Marie Curie in Paris.

But for researchers and developers to experiment with new technologies, from content-delivery methods to wireless communications and location-awareness, they need somewhere to run tests and measure the results. In effect, they need a high-performance, adaptable, scalable, low-cost and easy-to-use playground. Thanks to the efforts of the EU-supported OneLab[1] project, they now have one.

Based primarily on the results of two projects, OneLab (2006-2008) and OneLab2 (2008-2010), which were supported with combined funding of around EUR 8.2 million from the European Commission, the OneLab initiative is today offering the telecommunications and internet research community access to a range of innovative tools and test beds.

Among them is PlanetLab Europe, the European branch of a global network of open computers available for the development of new network services. With more than 300 virtual server nodes spread across the continent, PlanetLab Europe is already being used by almost 2000 researchers. It constitutes one of the most realistic platforms available for trial deployment and experimentation, with services such as distributed storage, network mapping, peer-to-peer systems, distributed hash tables and query processing.

A key part of PlanetLab Europe's development and its interconnection with similar resource platforms in the United States and Asia is the concept of federation, introduced by the OneLab researchers and now becoming increasingly popular in other research disciplines.

A federation of test beds

'There are lots of test beds out there: every test bed has its own value but they are only used by the people who develop them — and have a very short lifespan because they are usually established for a specific purpose and used only while the funding for them lasts. However, at the same time, it is completely useless to try to design a test bed that will fit everyone's needs. It's just impossible, each community has different requirements — the wireless community would like one thing, distributed systems developers want other stuff, the cloud community would be different again... and so on,' Prof. Fdida, the coordinator of OneLab, explains. 'But because there are commonalities, our approach was therefore to bring these test beds and the organisations behind them together in a federation system, enabling technology to be reused, helping developers avoid repeating mistakes and reinventing the wheel, enabling them to share best practices, and aggregating funding to benefit from the multiplier effect.'



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Besides the far-reaching and diverse array of testing resources offered by PlanetLab Europe, the OneLab team also followed the same approach to establish more focused test bed platforms, among them NITOS for real-time wireless testing, Etomic for high-precision measurement of network capabilities, and DIMES to study the topology of the internet.

'One of the main challenges was to advance the idea of federation as being critical for the design of a Future Internet facility,' Prof. Fdida says. 'There are issues

related to governance, trust, authentication, resource description, user access, scheduling of tests, isolation of experiments to avoid excessive resource use, monitoring and data collection... a multitude of software and architectural challenges. But the benefits of a federated system are obvious, not least that it offers the research community easy access to many resources at much lower cost in terms of test-bed development time and money.'

In establishing their federated platform, the OneLab team developed a range of publicly available test-bed components, from open source software to hardware packages, as well as measurement tools, enabling any developer to use the underlying technology to set up their own test bed and, if they choose to, join the federated platform.

Today, a significant part of the core software underlying all of the PlanetLab platforms, including the original one in the United States, has been developed in Europe. And it has also started to be used commercially. Orange Poland, formerly Polish Telecom, for example, has further developed the software and is currently using it for its content-delivery network.

Meanwhile, some of the tools are also being transferred in M-Lab, an open, distributed server platform for researchers to deploy internet measurement tools, set up by Google. And the OneLab team have also launched a spin-off project with EU funding called OpenLab, bringing together the essential ingredients for an open, general purpose and sustainable, large-scale shared experimental facility.

In addition, the project partners have started to work with the European Institute of Innovation and Technology (EIT), which has launched a programme of Knowledge and Innovation Communities (KICs) integrating higher education, research and business in key areas. Specifically, the OneLab researchers are willing to offer their federated platform to students in a KIC Masters' programme which is focused on ICT, giving them the opportunity to become familiar with the concepts of the 'networking domain' using the PlanetLab facility.

'In my view, developing this further is not just about research and innovation, it's also about education. And our collaboration with the KIC ICT will give young, talented students the opportunity to use very diverse, cutting-edge technology,' Prof. Fdida says.

In the long run, the OneLab coordinator sees the team being in a position to fully evaluate the benefits of their work and approach within the next two to three years. In the meantime, OneLab will continue to evolve, cooperating and competing with similar initiatives such as GENI in the United States and a soon-to-be-launched platform in China.

OneLab and OneLab2 received research funding under the European Union's Seventh Framework Programme (FP7).

The project was coordinated by the University Pierre et Marie Curie in Paris, France.

1 'An open, federated laboratory supporting network research for the Future Internet'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Information and communication technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9695

The space-time connection

European scientists are developing what may be the most precise clocks ever built. Based on laser excitation of atoms, these optical clocks will have a ticket to ride aboard the International Space Station (ISS) for a test run.

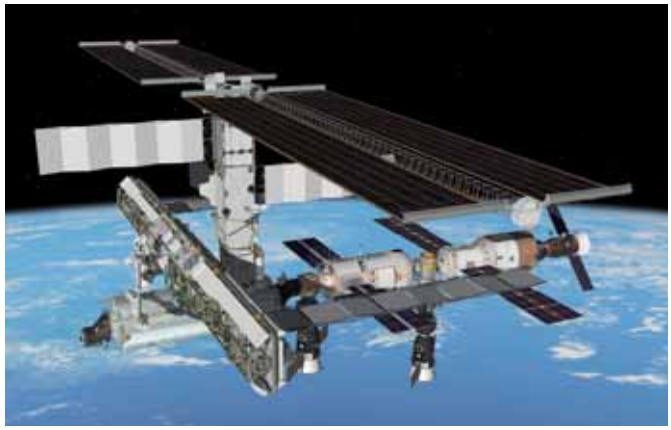
Clocks are conceptually rather simple devices. They are based on a repeated event that occurs at a highly regular interval and a mechanism for keeping track of the events. Grandfather clocks get their reference interval from a swinging pendulum. Quartz watches get theirs from an oscillating crystal.

Atomic clocks measure the frequency of electron transitions from one orbital to another in atoms of certain elements. Transitions are so reproducible that the definition of a second is currently tied to atomic transition. The standard is cesium-133 (Cs-133).

Cesium -based clocks 'tick' at about 1 trillion times per second, operating in the microwave range of the electromagnetic (EM) spectrum of frequencies. Optical clocks, operating in the visible light range of the EM spectrum (frequencies of 1 million trillion times per second), would be capable of even greater accuracy.

Furthermore, optical clocks use neutral atoms (zero net charge) or ions (charged species) conditioned to absorb light over an extremely narrow frequency range. The excited atoms are then trapped inside an optical lattice.

A European consortium is developing ultra-precise portable neutral-atom lattice optical clock demonstrators for use in space. Their goal is to provide a 10-fold increase in performance compared to microwave atomic clocks employed in a previous European Space Agency (ESA)-backed ISS mission.



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With EU funding for the SOC2[1] project, scientists developed laser technology and integrated it with atomic set-ups for strontium (Sr) and ytterbium (Yb). They are investigating two novel approaches for loading the atoms into the optical lattice clock.

SOC2 technology is expected to impact space- and ground-based investigations of time and gravity and the commercial development of technology relying on lasers and high-precision timing devices. It might even provide the basis for the new standard of measurement of the second.

The project was coordinated by the Heinrich-Heine-Universität, Düsseldorf in Germany.

1 'Towards Neutral-atom Space Optical Clocks: Development of high-performance transportable and breadboard optical clocks and advanced subsystems'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Space'.
http://cordis.europa.eu/marketplace > search > offers > 9837

IT AND TELECOMMUNICATIONS

Putting accessibility at the heart of e-government

Public administrations across Europe are making the leap from government to e-government, but citizens will only reap the rewards of being able to access more services online if they are efficient, accessible and easy to use. A new user-centric web-based platform, developed by EU-funded researchers, promises to bring down the barriers to accessing e-government services.

Developed by the Diego[1] project, the platform offers a scalable, open-standards-compliant solution for public administrations looking to implement e-government services from scratch or update existing ones to a more user-friendly and accessible system. The project's completion, following two years of work supported by EUR 2.5 million in funding from the European Commission, comes at a crucial time for the roll-out of e-government in Europe.

On the one hand, the increasingly widespread use of mobile devices such as smart phones and tablet computers, even among the elderly and traditionally less tech-savvy citizens, is creating demand and opportunities for more inclusive online services accessible at anytime, anywhere. On the other hand, public administrations are increasingly coming to realise that in many cases the e-government services they have deployed in recent years, often at substantial cost, do not meet citizens' needs or are not easily accessible to inexperienced users. And, as European Commission Vice-President Neelie Kroes, recently pointed out, such systems have often been developed in isolation, creating digital borders between towns, regions and countries where physical boundaries have long since disappeared.[2]

'Over the last five to 10 years, public administrations of all sizes have spent millions on e-government services but often they weren't planned or designed very well. The result is people don't use them, and in many cases penetration is as low as 10 or 15%,' explains Alejandro Echeverría, marketing director at IDI EIKON in Spain, the Diego coordinating partner.

Inclusive e-government

The Diego platform aims to overcome that problem. It is designed with user-friendliness firmly in mind, allowing anyone, regardless of their level of digital literacy, to access online services through an adaptable and intuitive interface. And, as a web-based standards-compliant system, it is accessible from any device, including smart phones, televisions and digital kiosks in public locations.

For administrations, implementing the Diego system is cost-effective and relatively straightforward, even in cases where they have legacy e-government systems that need to be updated or transferred.



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'The basic framework for the system is the same for all applications and the use of open standards, and its provision as software-as-a-service helps overcome interoperability issues. However, some services need to be tailored specifically to the requirements of individual administrations. For example, data protection and data-management laws are different in every country, so how data is stored and accessed, whether locally or using cloud resources, varies in each case,' Mr Echeverría explains.

The differences were underscored in seven pilot deployments of the Diego platform involving public administrations in Cyprus, Ireland, Italy, Spain and the United Kingdom. In each case, a variety of different e-services were developed or migrated on to the Diego system. In the trials, citizens could access a range of e-government services: they could arrange appointments with local councillors, find out about training courses, renew their ID cards or look for jobs. End-users, including less ICT-experienced elderly citizens, generally found the system easy to use, and appreciated the range of services on offer.

'One key focus of the pilots in Spain was employment services — understandably, given the high unemployment rate here at present. Job searches used to be handled at the regional level, but they are now being offered at the local level, and in most cases the systems used to provide access weren't very efficient or accessible. With the Diego system we have been able to interconnect job databases, connecting with private job search engines and the EURES European portal, providing citizens with better access and enabling them to upload their CVs and apply for jobs online,' Mr Echeverría says.

Saving time and cutting costs

For administrations, the costs of implementing the system are relatively low: it costs around EUR 150 per month to use the Diego platform in a town of 10 000 to 15 000 people and, depending on specific requirements, it takes just one or two months to set up.

The system is continuing to be used at many of the pilot sites, and IDI EIKON, in collaboration with other project partners, is looking to deploy it with other public administrations across Europe in the future. Among other possible uses, the United Nations Development Programme (UNDP) is looking at the system to open communications channels and enhance social and cultural interaction between communities in north and south Cyprus. In addition, Mr Echeverría points out that the platform, being 100% web-based, 'fits perfectly' into the European Commission's recently launched strategy to drive business and government productivity via cloud computing.

Mr Echeverría notes, however, that uptake of the platform is dependent on several factors, not least the will of politicians and other stakeholders to implement e-government services or update existing ones. In addition, the economic crisis and the scaling back of public budgets across Europe also represent a challenge, despite the mid- to long-term benefits of e-government.

'Ultimately, stakeholders need to realise that e-government saves everyone time and money. If citizens can complete procedures online, they don't need to go to public administration offices, queue up, and occupy the time of a government official. It's hard to quantify the cost savings, but it's realistic to think that a procedure that may cost a couple of euros to complete in the traditional way will only cost a couple of cents if it is done digitally,' Mr Echeverría explains.

In addition, the Diego researchers found that by introducing users, some of whom had little or no ICT experience, to the platform, the same people went on to access other services online.

'After using the system, some elderly people went on to set up Twitter or Facebook accounts to communicate with friends and family,' Mr Echeverría explains. 'We like to see the platform as a training bicycle, in which access to e-services are the support wheels that help people get on their way in the online world — it's a big step forward to e-inclusion.'

It is also an important leap towards more widespread and effective e-government in Europe. As Neelie Kroes has noted: 'Dealing with government services can be trying or time-consuming. First and foremost, governments should put users in control, and in the centre. I want citizens to benefit from services they really want to use, services targeted to their needs, services that are smooth and seamless.'[3]

The Diego platform sets an important example for how that can be achieved.

Diego received research funding under the European Union's Competitiveness and Innovation Framework Programme (CIP).

The project was coordinated by IDI EIKON in Spain.

1 'Digital inclusive e-government'.
2, 3 'Build, Connect, Grow': The road towards borderless eGovernment'. Speech at Sixth Ministerial eGovernment Conference, Poznan, Poland, 17 November 2011

Funded under the FP7 specific programme 'Cooperation' under the theme 'Information and communication technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9871

A low-cost, fingernail-sized radar

EU-funded researchers have squeezed radar technology into a low-cost fingernail-sized chip package that promises to lead to a new range of distance- and motion-sensing applications. The novel device could have important uses in the automotive industry, as well as mobile devices, robotics and other applications.

Developed in the Success[1] project, the device is the most complete silicon-based 'system-on-chip' (SoC) package for radar operating at high frequencies beyond 100 GHz.

'As far as I know, this is the smallest complete radar system in the world,' says Prof. Christoph Scheytt, who is coordinating the project on behalf of IHP in Frankfurt, Germany. 'There are other chips working at frequencies beyond 100 GHz addressing radar sensing, but this is the highest level of integration that has ever been achieved in silicon.'

Measuring just 8 mm by 8 mm, the chip package is the culmination of three years of research by nine academic and industrial partners across Europe, supported by EUR 3 million in funding from the European Commission. The team drew on expertise from every part of the microelectronic development chain to develop the groundbreaking technology, which is expected to be put to use in commercial applications in the near future.

Operating at 120 GHz — corresponding to a wavelength of about 2.5 mm — the chip uses the run time of the waves to calculate the distance of an object up to around three metres away, with an accuracy to within one millimetre. It can also detect moving objects and calculate their velocity using the Doppler effect.

From a commercial perspective, the technology is also extremely cheap: manufactured on an industrial scale, each complete miniature radar would cost around one euro, the project partners estimate.

That gives it the potential to replace ultrasonic sensors for object and pedestrian detection in vehicles, to be used for automatic door control systems, to measure vibration or distance inside machines, for robotics applications and a wide range of other uses. It could even find its way into cell phones.

To develop the miniaturised radar system, the team had to overcome a range of technical challenges, not least integrating and ensuring the reliability of the tiny antenna.

'In this area, size matters a lot,' Prof. Scheytt notes. 'The main motivation for using high frequencies rather than lower ones is that the antennas can be smaller.'



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While an FM radio has an antenna that is about one metre long and a WiFi router's antennas are about 10 cm in length, at mm-wave frequencies (between 30 GHz and 300 GHz) the antennas can also be at the millimetre scale. Given the increasing miniaturisation of modern devices — from cell phones to robotics components — working in the millimetre range is therefore a significant advantage.

A novel substrate to solve attenuation

However, at high frequencies unwanted electromagnetic radiation and high attenuation are serious problems. 'The higher you go in frequency the more the wiring radiates: modelling this interface was a big challenge,' the project coordinator admits.

The Success team addressed the issue through precise modelling, a novel technique for antenna integration, and using a polyamide substrate for the antenna.

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'The project partners researched and tested a lot of different substrates for the antenna to find one that was the least lossy. Then they used a technique to print the antenna on it and connect it through solder bumps,' Prof. Scheytt explains. 'The antenna itself is planar, meaning it is mounted flat on top of the chip. This is completely different to the packaging technology of other millimetre-wave systems, which usually have bulky antennas with tube-like conductors. The advantage is that the whole "system-in-package" is a lot smaller.'

Another issue with high-frequency devices is testing that they work as they are designed to. Current testing techniques are expensive and ill-suited to the high-volume testing necessary if the device is to be manufactured commercially. To address this, the Success team took the unusual step of including self-testing features built in to the chip package.

'Built-in self-testing is quite common for cell-phone chips that work at much lower frequencies, but it is something quite novel for millimetre-wave chips,' Prof. Scheytt says. 'Our industrial partners put a lot of emphasis on including this as it makes no sense to have a chip that can be manufactured for a euro and then have to spend 30 or 40 euros to test each one.'

The built-in test features enable technicians to easily and cheaply test if the antenna is connected correctly, its transmission power and if it is operating in the right frequency range. And, because there is no radio-frequency interface to deal with, integration on to a printed circuit board is similarly cheap and easy.

'Since all the high-frequency circuitry is in the package you have only low-frequency interfaces to work with,' Prof. Scheytt notes.

He points out that an application engineer can handle the chip, because it is a standard surface-mount package, in much the same way they would fit an ultrasonic sensor or microcontroller.

'Users can solder the chip on to their standard circuit boards and receive low-frequency signals that can be processed without difficulty,' says Prof. Thomas Zwick, head of IHE at the Karlsruhe Institute of Technology (KIT), a project partner.

The different partners in the Success consortium are now looking to use the technology commercially. Bosch, for example, is investigating deployment possibilities, seeing major potential for low-cost radar operating at high frequencies, while other partners, such as Silicon Radar in Germany, Selmic in Finland, and Hightec in Switzerland are also expected to incorporate the work carried out in Success into their industrial processes.

Success received research funding under the European Union's Seventh Framework Programme (FP7).

The project was coordinated by IHP Microelectronics, Germany.

1 'Silicon-based ultra-compact cost-efficient system design for mm-wave sensors'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Information and communication technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9845

Integrated high-resolution urban-mapping system

EU-funded researchers have developed an urban-mapping system capable of distance resolution of 5 to 50 cm in one second. The technology provides a step increase in performance compared to current technology.

Geo-location and reference systems have become a part of everyday life. People use satellite-based navigation systems in their cars to navigate unknown roads and on their home computers to find their houses on detailed satellite images.

Satellite navigation systems that provide global coverage are collectively called Global Navigation Satellite Systems (GNSS). The term Global Positioning System (GPS) refers to the GNSS of the United States, the first such system that was fully operational. Galileo is Europe's own GNSS currently being built and tested by the EU and the European Space Agency (ESA).

GNSS provide information about the position of something on a global map. Another technology important in capturing images and measuring positions of things and the distances between them is 'Light detection and ranging' (LIDAR).

LIDAR technology is currently used to provide fast, accurate images over large areas such as those required in urban planning. These images can be complemented with lower-resolution images like those provided with web-based satellite services.

Geo-location of urban maps produced by LIDAR is currently provided by loosely coupled GPS/Inertial Navigation System (GPS/INS) receivers. So far, technology has proven to be very expensive and performance sub-par under conditions of poor satellite visibility.

With EU funding for the Atenea[1] project, European scientists integrated LIDAR techniques with GNSS/INS receiver architectures and Galileo signal-processing capabilities.

Atenea delivered a system capable of navigating 5 to 50 cm with a one second accuracy in difficult urban environments, providing a drastic increase in robustness and continuity at significantly lower cost.

Project technology facilitates numerous outdoor and even indoor applications not previously possible. It will be the key to terrestrial mobile mapping, the generation of 3D Earth surface models that include 3D urban models. Atenea has already been the enabler of several terrestrial geodata acquisition missions.

Overall, Atenea has not only delivered an innovative and improved geo-location technology but also a software development environment that will be valuable in future integration of navigation systems and sensors.

The project was coordinated by Deimos Space in Spain.



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1 'Advanced techniques for navigation receivers and applications'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Transport (including aerospace)'.
http://cordis.europa.eu/marketplace > search > offers > 9791

Business success: knowing the rules and making them work

Businesses may be run by people, but they have to follow rules. An EU-funded project is using semantic techniques to help businesses identify and adapt more easily the rules behind their operations.



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If there was ever a single 'secret' to business success, it was probably stated by Socrates some 2500 years ago: 'know thyself'. To maintain its success and improve its competitive advantage, every business must understand the details of 'what makes it tick', from how new products or services are developed to gathering and using customer feedback.

Thanks to powerful software systems, organisations can churn through data, analyse business processes and document the rules people must follow to comply with legislation, improve customer satisfaction and generally ensure that the organisation performs well.

Businesses use knowledge-management systems to record all the rules that govern the work people have to do; often the rules are so complex that it would be impossible for individuals to be able to do their job properly without the guidance of the knowledge-management system.

But most knowledge-based systems deployed in organisations today are tricky to set up and use. It is difficult to maintain the rules, adjust and tweak them as legislation changes or the business responds to competition or develops new working methods.

A complicated business

'The problem with knowledge-based systems at the moment is that they are encoded by knowledge-systems experts,' explains Christian de Sainte Marie from IBM, France. 'It can be extremely complicated to identify and document rules in the first place; then you have to actually write the computer code which will implement these rules through the business.'

'Knowledge-based systems are difficult to manage and maintain because they require the expertise of statisticians and data analysts, people involved in operations and customer-facing roles and technical computer programmers,' Mr de Sainte Marie continues. 'There are lots of different people, each with their own specialist expertise and knowledge.'

Mr de Sainte Marie coordinates the EU-funded Ontorule[1] project which was set up to give business experts more ownership of the rules, helping them to capture and implement them across the business, without requiring the expertise of software programmers, for example, to turn rules into computer code.

'The idea of the Ontorule project is to separate out knowledge from its implementation,' Mr de Sainte Marie explains. 'At the moment, the business experts, who are most aware of how the business operates and the constraints on its activities, have to somehow communicate this knowledge to IT experts, who then have to work out how the rules are expressed within software systems. We believe that by using highly defined vocabulary with agreed meanings, known as ontologies, we can separate out knowledge from rules, and the representation of the knowledge from its IT implementation.'

The Ontorule project is helping the relevant people in the organisation to manage and maintain ontologies, business rules and data models separately, without having to worry about how to communicate their work to others.

Make up rules... like a natural

One of the biggest challenges is to translate policies, legislation, statistical analyses and the strategic planning of a company's executive board, for example, into concrete, unambiguous, rules. The knowledge is often expressed in documents (legal texts, minutes of board meetings, etc.) written in prose.

Ontorule has applied natural-language processing technology to help business-knowledge experts formulate ontologies and express rules based on the text in documents. The natural-language processing software analyses texts, looking for key phrases, grammatical constructions and other features of a document to identify candidate rules. A business expert can then pick appropriate rules from the candidates and refine them, still using natural language and not having to worry about how they will be implemented in code.

'With this natural language processing, we have been able to suggest rules which are specified sufficiently precisely that there is little or no room for interpretation by the specialist who has to translate rules into computer-executable rules. This is quite a step forward, although the full automation of rule extraction from natural language is still a long way off,' Mr de Sainte Marie acknowledges.

The Ontorule business knowledge ontology brings together abstract business knowledge and concrete operational rules into a single domain. Experts in rule implementation and business strategy and compliance can effectively work from the same knowledge bank, thanks to the way an ontology organises knowledge in a highly structured and unambiguous way.

The Ontorule platform makes use of 'Semantics of business vocabulary and business rules' (SBVR) which is an internationally agreed standard for the high-level formalisation of business vocabulary and rules. It is close to natural language (making it understandable for business-knowledge experts) but also close to 'Web ontology language' (OWL) which is understood by experts in formulating and implementing business rules.

'Ontorule builds on the SBVR bridging format,' says Mr de Sainte Marie, 'that goes from the natural language description of a business and what it does to the highly structured and defined version of this description in an ontology. From this ontology you can then develop specific, usable business rules.'

Rules for the real world

The Ontorule technology and methodology has been tested in two prototype systems, one in car-maker Audi's design

>

department in Germany and another in a steel galvanisation plant belonging to ArcelorMittal.

ArcelorMittal use an expert software system to analyse the quality of its galvanised steel coils and assign which coils can be shipped to specific customers or whether they need repairing or recycling. The Ontorule system will be used to capture all the rules involved in this process — not just those programmed into the expert system, but all the other constraints, policies and contexts affecting the final shipping decision. Once the rules have been captured they can be implemented and adapted by other ArcelorMittal plants around Europe.

Peter Rosina has helped to test the Ontorule system in Audi's R&D department. 'We are using ontologies and business rules to capture and analyse some of the knowledge in our department,' he explains. 'During the project we were able to model business knowledge that we had never managed before using other systems. I can say for sure that using Ontorule technology to maintain our business knowledge is saving us time and reducing "digital waste". We no longer maintain our business knowledge in a spreadsheet, but in one centralised place where it is easier to store, monitor and update this knowledge to improve the processes within our design labs.'

The Ontorule project received EUR 6.1 million (of the total EUR 10.2 million project budget) in research funding under the EU's Seventh Framework Programme (FP7).

The project was coordinated by IBM in France.

1 'Ontologies meet business rules'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Information and communication technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9844

EU study tackles vision-mapping language

Scientists led by the Norwegian University of Science and Technology (NTNU) are developing sophisticated techniques to understand vision-language mapping across the lifespan in typically and atypically developing populations.



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The Lanpercept[1] project has received a Marie Curie Initial Training Network grant worth more than EUR 4 million under the EU's Seventh Framework Programme (FP7), to investigate the ability of humans to map visual information and language.

The Lanpercept team is testing novel tools and training software that will benefit the elderly who are diagnosed with dementia, and individuals with disabilities or disorders like deafness and autism. The software will enable them to negotiate the translation between vision and language.

The study will allow the researchers to identify behavioural and brain mechanisms that play a role in mapping visual information about language in daily events.

Thanks to the work being carried out in the study, the project partners who work in various areas of research will give practitioners in educational and health institutions the means to deal with challenges impacting European society.

'The current network is unique in bridging basic research and clinical research (which is still rare), with a strong focus on methodology and advanced techniques for studying language and perception,' said Prof. Mila Vulchanova, who is coordinating Lanpercept. 'This is a must for the European researcher for the future.'

The researcher commented on the significance of the clinical aspects of this network: 'Typically, we can see why and how basic research can contribute to improve and address clinical research and concerns. However, basic research can also benefit from studies conducted in clinical settings or with clinical populations, and clinical studies bring in a completely new perspective.'

'The evidence we get from clinical populations is extremely valuable and helps research zoom into specific problems or areas which may be specifically highlighted in the case of developmental or acquired deficits. This evidence complements the picture we have from typical populations.'

For the purposes of this study, researchers are developing theories that are able to capture the features of the visual environment and humans typically attend to. The results will provide insight into how visual objects, events and actions are shaping language understanding.

In terms of the diverse groups that make up the Lanpercept network, the partners said industry and academia are working together to obtain the best results.

Tommy Strandvall, the global head of Knowledge and Training at Tobii Technology in Sweden, said: 'This is a great opportunity for us as a full partner of Lanpercept to collaborate closely with eight outstanding European universities. By engaging an experienced researcher for 24 months we aspire to make new knowledge and eye-tracking solutions available to the research community.'

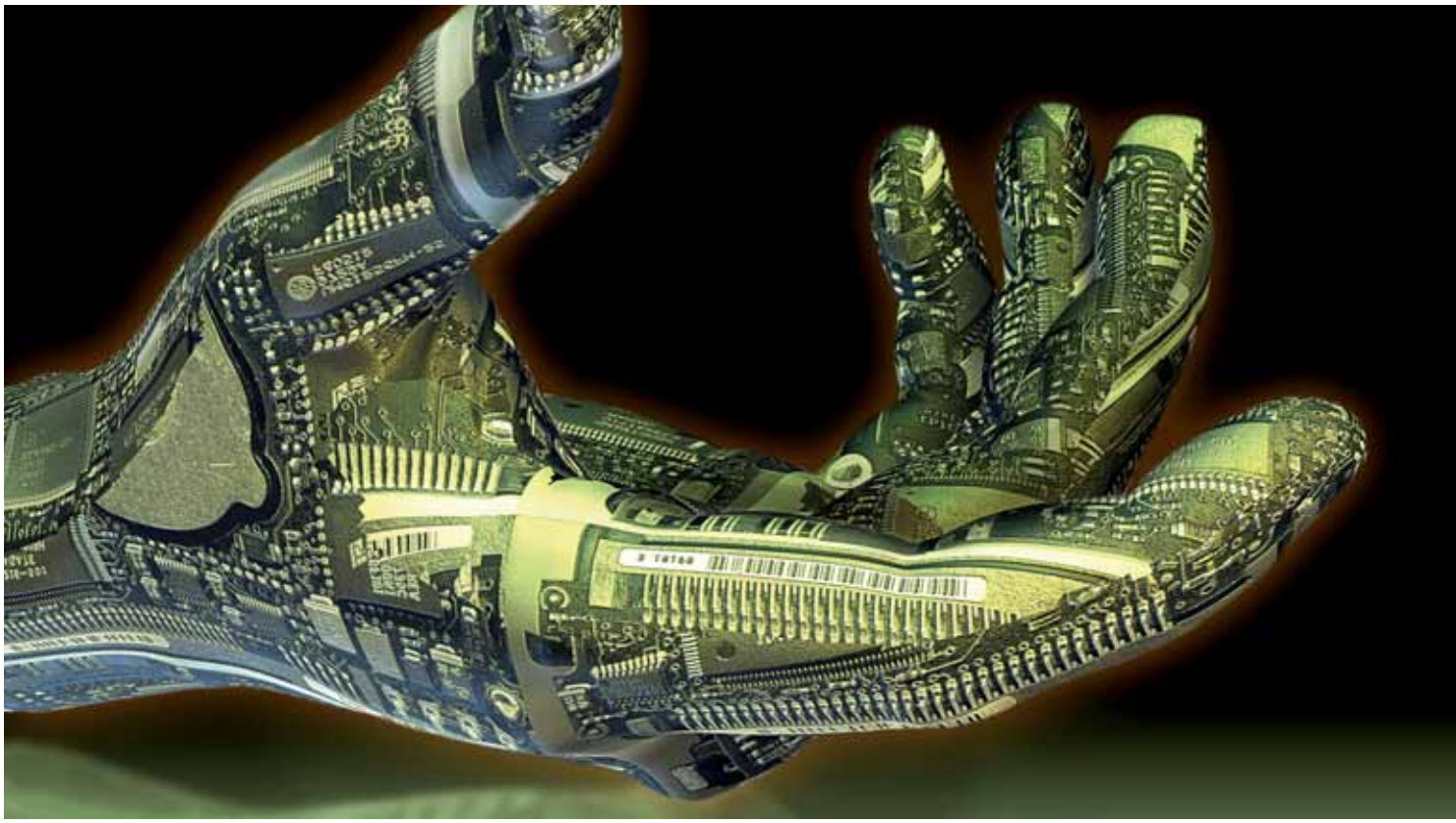
Martin Pötter, product manager at SensoMotoric Instruments GmbH in Germany, added: 'We at SMI are looking forward to the collaboration with senior specialists as well as future professionals in the area of language and perception to better understand the needs and develop the next generation of research tools for this community.'

Experts from Denmark, Germany, Spain, the Netherlands, Sweden and the United Kingdom are contributing to this study.

The project was coordinated by the Norwegian University of Science and Technology (NTNU).

1 'Language and perception'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
http://cordis.europa.eu/news > search news > 35251



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Employing virtual reality technology to revolutionise manual work

A European-funded project promises to improve productivity and working environments across Europe, thanks to its newly developed system which combines virtual and augmented reality technology, ergonomics and product lifecycle management.

According to Eurostat, in 2011, 15.7 million people were involved in high-knowledge manual work in Europe, mainly as plant and machine assemblers and operators. But one result of globalisation is that some work, in particular manual work, which is an expensive component of manufacturing, is increasingly being outsourced globally. While reducing costs, this does create its own set of problems: increased lead times, lower-quality products and services, and weaker management.

The partners in the Manuvar[1] project have developed a modular, reconfigurable system that will support manual work across a range of industries.

Outsourcing is not always an option: work such as spacecraft assembly, maintenance of power plants, operation of complex machinery, and design and manufacturing of highly customised products requires high-level knowledge and skills in manual workers. 'Manuvar could improve utilisation of the workforce's knowledge and raise global competitiveness,' commented Manuvar's Project Coordinator, Dr Boris Krassi from the VTT Technical Research Centre in Finland. 'This in turn will protect domestic employment and result in better quality, a shorter time to market and better value.'

As a result of the researchers' efforts, the Manuvar system can successfully improve all aspects of manual work for all actors involved in the product life cycle, from engineers and managers to workers and operators. The system enhances communication in the product life cycle, supports workplace and work procedures design, and facilitates training and the delivery of instructions.

During a demonstration phase of the project, held in February and March 2012, senior managers and engineers from European industry confirmed the potential of the system in real manufacturing scenarios. They were enthusiastic in their feedback: 'This is exactly what we need to provide efficient communication ... With this system you may design a good workstation right first time ... The application would save us many man hours... We would also improve customer service via the application... Also, the quality of our work would clearly be improved.'

The project was organised around five clusters: spacecraft assembly, assembly lines and small and medium-sized enterprises (SMEs), remote maintenance, power plants, and heavy machinery. These areas represent niche industries as well as crucial sectors that are vital for Europe's economic as well as scientific future.

Manuvar included 18 partners from eight EU countries, was coordinated by the VTT Technical Research Centre in Finland, and received more than EUR 7 million in funding from the EU's Seventh Framework Programme (FP7).

1 'Manual work support throughout system lifecycle by exploiting virtual and augmented reality'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://ec.europa.eu/research/infocentre > search > 28153

INDUSTRIAL TECHNOLOGIES

Bioplastic bottles from agricultural waste

EU-funded scientists are developing fermentation processes to produce natural polymers as an alternative to traditional petrochemical-based ones. Overcoming the cost barrier should facilitate widespread commercialisation.

Polymers have many industrial applications, from plastic beverage and food containers, to foams for furniture and construction, and products as diverse as bicycle helmets and cell phones. Most polymers consist of hydrocarbons, compounds made primarily of hydrogen and carbon.

Synthetic polymers are usually derived from petrochemicals (so-called 'fossil fuels', derived from the remains of living organisms). Numerous polymers also exist in nature, among them the nucleic acids that form our genetic material, the cellulose in wood fibres and even spider silk.

'Polyhydroxyalkanoates' (PHAs) are biopolymers that could replace petrochemical plastics in many applications. PHAs are natural, renewable and biocompatible, and are produced inside the cells of bacteria. They can be derived from biotechnological conversion of waste from slaughterhouses, oil-processing plants and biodiesel factories.

Until now, the major obstacle to widespread adoption of PHAs by the plastics industry has been their prohibitively high production costs compared with low-cost petrochemical equivalents.

In the Animpol[1] project, European scientists sought to develop cost-effective production mechanisms for these highly valuable biopolymers to avoid the necessity of future imports, while creating a win-win situation for all players.

The researchers carried out a vast amount of work related to production, isolation and characterisation of PHAs via experimental and mathematical modelling methods. They also started processing industrial amounts of PHAs to gain insight into the processing behaviour of these biomaterials.

Results to date demonstrate that the Animpol team has developed a viable strategy for converting agricultural and industrial waste into raw materials for value-added bio-products.

Commercialisation of the technology in order to utilise waste streams at the sites where they are produced should have a positive impact on jobs and the local environment.

The project was coordinated by the Technische Universität Graz in Austria.



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1 'Biotechnological conversion of carbon containing wastes for eco-efficient production of high added value products'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE).
http://cordis.europa.eu/marketplace > search > offers > 9651

Linking factories via a manufacturing software tool

EU-funded scientists are developing a novel software-based manufacturing tool linking factories in production networks. The software environment should help small businesses benefit from shared resources and economies of scale.



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Cloud computing is a relatively new concept in 'Information and communication technologies' (ICT). Cloud architectures make available a number of distributed applications and ICT services for use with remotely located data in order to enable management and execution of tasks across multiple physical locations.

Cloud ICT systems offering software-as-a-service facilitate collaboration, agility, scaling up or down according to demand, and the potential for cost reductions by pooling resources.

Application of such services could assist European manufacturers in transitioning from mass-production to the personalised, customer-oriented

approach. Such a transition is key to securing a competitive position in today's economy.

By encouraging small and medium-sized enterprises (SMEs) to join production networks, the European manufacturing economy could optimise production planning and processes throughout the whole supply chain.

European investigators initiated the Manucloud[1] project to evaluate a production cloud-based IT scenario that takes multiple levels of the manufacturing value chain into account.

The consortium defined the Manucloud architecture requirements based on main use cases. The prototype system consisted of three components: the within-factory (intra-factory) domain, the across-factories (inter-factory) component, and the module for configuration of the front-end product.

These parts were designed to enable seamless integration among customers, product integrators, and product and component manufacturers. Intra-factory-related tasks included description of factory equipment that was then used to describe equipment-level services and parameters. These were integrated into process-level services and parameters to form aggregate manufacturing services.

Inter-factory IT service infrastructure required interfaces to the intra-factory and front-end domains to enable coordination of virtual organisations, process plan initialisation and product orders. The front-end system used a web portal for ease of use.

Specific parameter sets were included to enable creation of a manufacturing service for two test products, an 'Organic light-emitting diode' (OLED) and 'Organic photovoltaic' (OPV) elements. Several Manucloud ICT system tests demonstrated proof-of-principle.

The growth in complexity of consumer demands has significantly increased scale-up time, risk and costs, particularly for SMEs. Manucloud may soon provide a viable manufacturing ICT solution to these problems.

The project was coordinated by the Fraunhofer-Gesellschaft zur Förderung der Angwandten Forschung E.V., Germany.

The Imagingelectrons project resulted in numerous publications in peer-reviewed journals and has advanced the state of the art in photoelectron imaging not only through its own work but through collaborations with others.

The project was coordinated by the Consiglio Nazionale delle Ricerche in Italy.

1 'Distributed cloud product specification and supply chain manufacturing execution infrastructure'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9628

Automated polishing of complex shapes

Manual polishing of machine tools with complex shapes is costly and time consuming. The European tooling industry is set for its own revolution thanks to automated polishing technology being developed by an EU-funded consortium.



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Since the Industrial Revolution, the use of machines to do work has advanced manufacturing exponentially. However, producing the machine tools to do that work still relies on human hands, at least in part.

Machine tools are largely made using dies and moulds, structures with special geometries that form materials into complex shapes. The final process in machine-tool manufacturing is finishing — polishing a component's surface to make it smooth and non-abrasive.

As machine tools have become quite complex, finishing of free-form surfaces with function-relevant edges (the norm in about 95 % of today's tools) is accomplished by time- and cost-intensive hand polishing. In fact, more than 10 % of manufacturing costs and between 30 and 50 % of manufacturing time are devoted to finishing.

Automated laser polishing and force-controlled robot polishing have been successful in the finishing of flat surfaces, but have not yet been applied to free-form surfaces due to technical difficulties.

A European consortium is changing the rules of the game with EU funding of the Polimatic[1] project. Researchers and partners defined selected work pieces and assigned one of the two polishing techniques in order to assist in process specifications based on intended use.

Process strategies were developed for both of the selected processes. The team enhanced machine technology for laser polishing and developed new algorithms for programming the robot as well as simulation software for robotic polishing. As regards the latter, the scientists built and tested two prototype force-control modules.

Scientists also developed standardised methods of >

measurement of surface roughness to be used both in the optimisation of processes and also in 'Metrology-assisted manual polishing' (MAMP).

Polimatic technology will provide a major breakthrough in machine-tool manufacturing, for the first time enabling widespread automation of the time-consuming and costly manual finishing of freeform machine tools.

In addition to enhancing the competitiveness of the European tooling industry, Polimatic technology could find broad application in other industrial sectors in which the smooth polishing of parts is important. These include medical implants and devices, engine parts and valve components, to name a few.

The project was coordinated by the Fraunhofer-Gesellschaft zur Förderung der Angwandten Forschung E.V., Germany.

1 'Automated polishing for the European tooling industry'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9832

High-tech materials from Mexico's mines

Although mining is an age-old industry, a team of European and Mexican scientists are developing novel cutting-edge materials from one of Mexico's most important metals.

Mexico is a country with a mining history stretching back nearly 500 years. Its bismuth mines are a major part of the country's economy and it was the third largest bismuth producer in the world in 2010.

The physical properties of bulk bismuth are well known. It is a semi-metal with unusual electronic properties that are often present in compounds and alloys of bismuth (the former when combined with non-metals, the latter with metals).

In recent years, scientists have discovered that many materials on the scale of atoms and molecules have unique and exciting properties relative to those of the same bulk material. 'Nanomaterials' science has become a very critical field of research in developing new products of all types.

A consortium of scientists from the EU and Mexico initiated the Bisnano[1] project to explore the properties and potential applications of bismuth and its compounds when synthesised at the nanoscale.

Researchers are synthesising and characterising nanomaterials for use in lubricants, energy production, optoelectronics and so-called smart materials that respond to changes in the environment (e.g. current generation in response to a deformation).

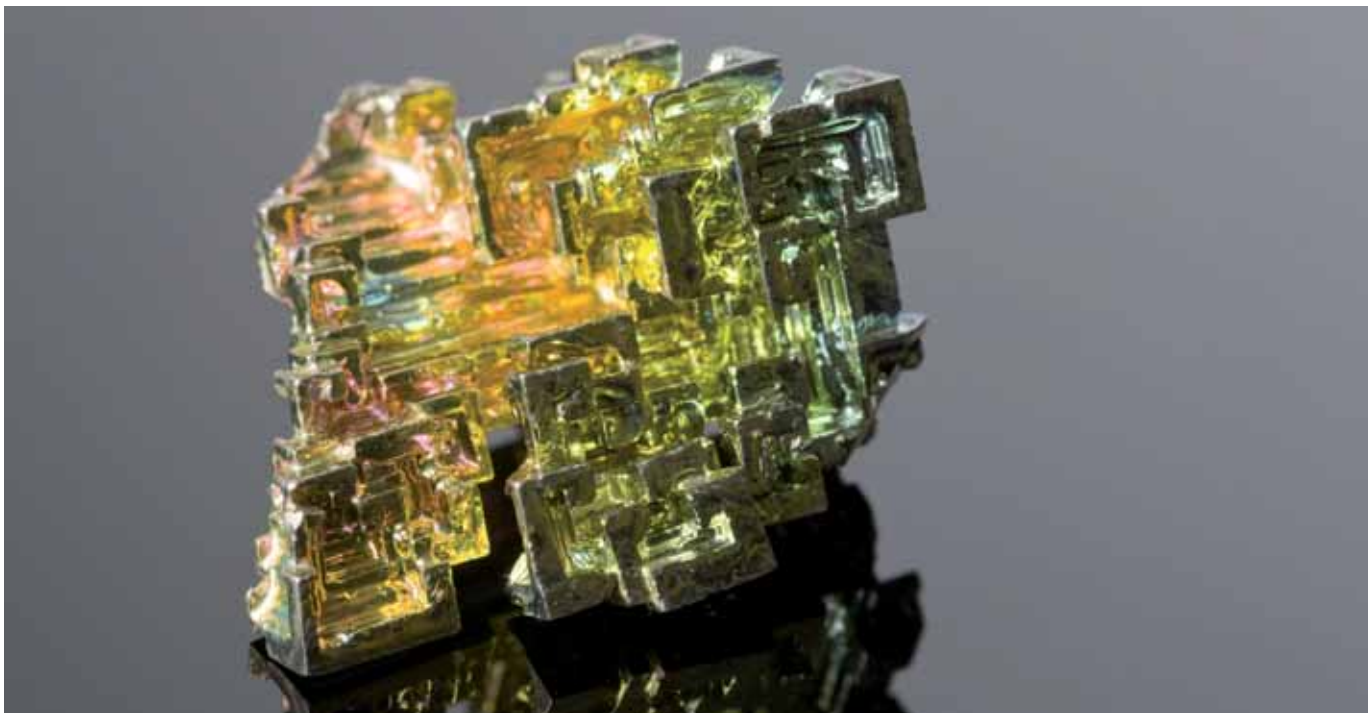
To date, the team has developed numerous interesting bismuth-based nanoparticles, nanowires and thin films. The materials have potential applications in all areas identified in the project proposal.

Although bismuth has been touted as the 'green' heavy metal due to its eco-friendliness compared to lead, a major part of the Bisnano project is concerned with cytotoxicity tests now under way. Bisnano is expected to write a new chapter in Mexico's long history in bismuth mining.

The project was coordinated by the University of Picardie — Jules Verne, France.

1 'Functionalities of bismuth-based nanostructures'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9797



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Custom-ordering apparel with integrated electronics

EU-funded scientists are developing an entire supply-side paradigm for customised clothing with integrated electronics. Customers will be able to choose both electronics and production processes that suit their levels of eco-consciousness.



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Mass customisation is a term coined around 25 years ago to reflect manufacturing and marketing combining the personalisation of custom-made products with the flexibility and low cost of mass production.

Since then, many companies have sought to implement and benefit from mass-customisation principles. A common example is a software core that enables the user to make certain changes for tailor-made functionality.

European researchers are extending currently available garment customisation for men's, women's and children's clothing targeting small and medium-sized enterprises (SMEs) with EU funding of the Micro-dress[1] project.

The products of interest are garments with integrated microelectronics such as those important in the consumer health sector. Scientists are developing manufacturing techniques, screening tests and an e-supply chain management platform to include, for the first time, user-configurable functionality and user-selected level of a material's eco-friendliness.

Giving the customer the freedom to select both the devices included (sensors, actuators and physiology monitoring devices) and the level of eco-friendliness of production processes will provide a truly customised experience.

To date, the consortium has carried out digital printing on fabrics to integrate solar cells, electrically conductive layers and lighting devices. A removable microelectronic card and jacket with motion-tracking capabilities are in the prototype phase.

Tools are being developed to estimate and predict the eco-efficiency of production, including associated air and chemical emissions associated with toxicity. The final e-supply chain platform enabling selection of functionality and level of eco-friendly production processes is currently being designed.

Micro-dress has the potential to revolutionise the garment industry, making mass customisation of garments with microelectronics integrated into the fabric a reality rather than science fiction.

The project was coordinated by the Athens Technology Centre SA, Greece.

1 'Customised wearable functionality and eco-materials extending the limits of apparel mass customisation'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9676

INDUSTRIAL TECHNOLOGIES

Fast and precise microsystem manufacturing

Novel technology being developed and tested by EU-funded researchers should ensure fast and accurate manufacturing of microsystems. Exploitation is expected to reduce the need for outsourcing and boost European competitiveness.



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Forecasts regarding the evolution of the semiconductor industry and integrated circuit (IC) fabrication suggest that shrinking component dimensions will not be sufficient to achieve performance and cost benefits in smaller volumes.

Three-dimensional (3D) integration is an emerging technology that may provide the solution to the density problem. It can be used to form vertically stacked and connected materials and components with a number of important benefits. Among these are reduced power, packaging and costs with increased performance.

European researchers initiated the FAB2ASM[1] project to develop technology for high-throughput and precise 3D integration for microelectronics.

Current integration technology for 3D microsystems relies on robotic machines and machine vision which must sacrifice speed for precision and vice versa.

The FAB2ASM consortium is developing hybrid assembly technology combining robotic tools with self-alignment processes based on physical forces acting at the micro-scale. The consortium has already developed the necessary components, tools, and self-assembly and joining technologies as well as the joining materials. It has also designed three different industrial demonstrators. Tests on industry samples demonstrate the ability to handle small and thin microchips, ultra-high chip-assembly speed and very high precision.

FAB2ASM should have no problems reaching its goal of simultaneously fast and accurate 3D integration technology for multifunctional microsystems, overcoming the current bottleneck to commercialisation.

Exploitation of the technology will no doubt have an important impact on European nano- and micro-manufacturing, enabling competitive production of innovative products that would otherwise have to be outsourced.

The project was coordinated by Aalto-Korkeakoulusaatio in Finland.

1 'Efficient and precise 3D integration of heterogeneous microsystems from fabrication to assembly'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9636

High-strength plastics using novel reinforcement

EU-funded scientists are studying the interface between molecules and the plastics in which they are embedded. Advances should result in products of superior strength for the automotive and aircraft industries.

Polymers are compounds made up of individual subunits called monomers. They are ubiquitous in nature (for example, starch and proteins) and are synthesised in industry for a variety of applications. 'Polyolefins' are synthetic polymers produced from simple olefins, or alkenes. Polyethylene and polypropylene are among the most common polyolefins industrially.

Polyolefin nanocomposites, materials made from a polyolefin matrix in which nanoparticles of some other compound(s) have been embedded ('intercalated'), have shown great promise in the lab. However, mass production using conventional equipment is expensive and results in products of inferior performance relative to expectations.

European scientists initiated the Nanotough[1] project to characterise the dispersion of nanoparticles within the polyolefin matrix. In particular, investigators are focusing on the interface between nanocomposite



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materials and the polyolefin matrix.

They are seeking ways to increase the stiffness and impact strength of polyolefin nanocomposites through development of new, cost-effective nanofiller-fibre (hybrid) nanocomposites.

In addition to synthesising novel polymers to enhance intercalation of nanoparticles in polyolefins, Nanotough scientists are using state-of-the-art microscopy and visualisation technology to study the interface structure and composition.

Using experimental data, they have developed improved models of nanocomposites. Experimental and theoretical data have helped the team to enhance several mechanical properties as well as provided important insight into chemical modification and processing.

Insight provided know-how that should help remove technical barriers to production leading to the realisation of the great performance potential of these materials. Mass production of such polyolefin nanocomposites could lead to fundamental changes in the way numerous metal and plastic-based products, such as those in the automotive and aircraft industries are used.

The project was coordinated by Aalborg Universitet, Denmark.

1 'Nanostructured toughened hybrid nanocomposites for high-performance applications'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9629

Making lightweight metal parts faster and easier

Scientists are improving state-of-the-art manufacturing technology with a focus on lightweight metal components. This innovation should have a major impact on numerous sectors of the EU economy.

Most people think of cutting and moulding processes when manufacturing is mentioned. A new type of manufacturing is revolutionising the field, making it possible to rapidly produce prototypes, and products in small quantities, for a fraction of the price.

Rapid manufacturing (RM), also known as additive manufacturing (AM), involves building components from the bottom up in successive thin layers using specifications provided by a three-dimensional (3D) computer-aided design (CAD) model. Benefits for large-scale manufacturing are numerous as parts with very complex geometries can be made without expensive castings or material waste.



© Chuck Rausin, Shutterstock

European scientists are developing RM techniques to produce lightweight metals with different internal structures: channels are used for thermal regulation and hydraulic system function; hollow zones, such as those created by honeycomb structures, and are employed to reduce weight; porosities are used in air and water filtering.

EU funding of the Compolight[1] project enabled researchers to address shortcomings of RM in relation to metal components and to create solutions in the context of selected part types.

Scientists in the project are formulating design rules to aid product designers, as well as guidelines and simulation software to assist end-users in defining a final product. The software also facilitates prediction of the quality and mechanical properties of manufactured items. In addition, the researchers are modifying CAD software for the design of lightweight items with inner open spaces and integrating RM techniques with conventional manufacturing methods.

With improved RM techniques, manufacturers can reduce the time-to-market of a design and associated costs due to lower energy consumption, fewer man hours and less waste.

The project has already produced an extensive toolbox for RM, including design guidelines and new algorithms to handle the complex 3D structures required by the project. It has also succeeded in significantly increasing the stability and reliability of RM machinery. Compolight also played an important role in the creation of the International Organization for Standardization (ISO) committee on AM technology.

The commercialisation of Compolight technology will influence innovative product design and manufacturing — and should benefit the environment by reducing the emissions associated with energy consumption.

The project was coordinated by the Dansk Teknologisk Institut Forening in Denmark.

1 'Efficient and precise 3D integration of heterogeneous microsystems from fabrication to assembly'.

Funded under the FP7 specific programme 'Cooperation' under the theme 'Nanosciences, nanotechnologies, materials and new production technologies'.
http://cordis.europa.eu/marketplace > search > offers > 9636

EVENTS

International conference on agents and Artificial Intelligence

The fifth 'International conference on agents and Artificial Intelligence' will take place from 15 to 18 February 2013 in Barcelona, Spain.

The concept of agent has become increasingly important in both Artificial Intelligence (AI) and mainstream computer science. Over recent decades, little consideration has been given to the issues surrounding agent synthesis, but this topic is now widely discussed by researchers in mainstream computer science, as well as among those working in data communications, robotics and user-interface design.

The conference will be a forum for researchers, engineers and practitioners to discuss both applications and current research within the field of agents, multi-agent systems and software platforms.

For further information, please visit:
http://www.icaart.org/

International conference on sustainable construction and design

The fifth 'International conference on sustainable construction and design' will take place from 20 to 22 February 2013 in Ghent, Belgium.

Sustainable construction encompasses environmental concerns, health and issues of convenience. Buildings account for the largest share of the EU's total final energy consumption (42 %) and produce about 35 % of all greenhouse gas emissions. In order to reduce their environmental impact, the way they are built and designed needs to be reconsidered.

The conference will cover different aspects related to the mechanical failure of structures and machine components, with a focus on tribology and fatigue in today's constructions. It will be a forum for various specialists to ensure that today's research meets the requirements of tomorrow's end-users.

For further information, please visit:
http://www.scad.ugent.be/

International conference on technical and legal aspects of the e-Society

The fourth 'International conference on technical and legal aspects of the e-Society' (Cyberlaw2013) will take place from 24 February to 1 March 2013 in Nice, France.

Cyberlaw is a new phenomenon that has emerged since the advent of the internet in an unplanned and unregulated manner. The emergence of cyberspace as a new 'environment' that people can inhabit has created various legal challenges and difficulties which have to be dealt with. Cyberlaw does just that, building on principles such as intellectual property, freedom of speech, privacy and public access to information.

The event will be a forum for stakeholders to exchange views and discuss some of the latest trends in this field.

For further information, please visit
http://www.iaria.org/conferences2013/cyberlaws13.html

International conference on education and management innovation

The second 'International conference on education and management innovation' (ICEMI 2013) will take place from 24 to 25 February 2013 in Rome, Italy.

In today's fast-paced, converging world, sustained innovation is a necessity. To ensure it, educational institutions and other organisations require constant monitoring to identify potential areas for improvement. However, educational reforms are often not well implemented. This results in a waste of money and human resources, as well as untapped potential.

The conference will be a forum to promote research and development activities in education and management innovation. It will also allow for the exchange of scientific information between researchers, developers, engineers, students and practitioners.

For further information, please visit
http://www.icemi.org/index.htm

World Sustainable Energy Days

The 'World Sustainable Energy Days' will be held from 27 February to 1 March 2013 in Wels, Austria.

In a recent speech, the Secretary-General of the United Nations Ban Ki-moon urged member countries to act decisively to tackle the 'growing crisis' of climate change. Europe is also suffering from the consequences of this crisis, with extreme weather and unusually high temperatures that have served as a timely reminder of the need to invest in addressing the consequences of climate change.

The event will bring together various stakeholders to further raise awareness about green energy and efficiency. It will be an opportunity to showcase some of the latest technologies and initiatives from across Europe.

For further information, please visit:
http://www.wsed.at/en/service/home/

International congress on targeted anticancer therapies

The 'International congress on targeted anticancer therapies' (TAT 2013) will take place from 4 to 6 March 2013 in Paris, France.

Targeted cancer therapies are drugs or other substances that block the growth and spread of cancer by interfering with specific molecules involved in tumour growth and progression. By focusing on molecular and cellular changes that are specific to cancer, targeted cancer therapies may be more effective than other types of treatment, including chemotherapy and radiotherapy, as well as being less harmful to normal cells. On the other hand, the treatment raises new questions around the tailoring of cancer treatment to an individual patient's tumour, the assessment of drug effectiveness and toxicity, and the economics of cancer care.

The conference will be a forum for the scientific community to exchange clinical and translational research, as well as new molecularly targeted cancer therapeutics.

For further information, please visit
http://www.tatcongress.org/tat13-home.html

International symposium on ocular pharmacology and therapeutics

The 10th 'International symposium on ocular pharmacology and therapeutics' (ISOPT 2013) will take place from 7 to 10 March 2013 in Paris, France.

The prevalence of blindness in Europe is estimated to be at about 0.3%, which represents 7% of total world blindness. Most sight-threatening eye diseases among Europeans are age related, and the number of people affected will increase as a result of population ageing.

Advancement in the treatment of blindness depends on the development of new technologies that enable early detection, follow-up, and treatment of disease. The conference will discuss such technologies, notably methods for measuring visual function in clinical trials, stem cells and gene therapy for retinal diseases and corneal surface damage, and treatment for macular diseases and inflammation of the eye. It will enable interactions between European regulators, doctors, patient representatives and the pharmaceutical industry.

For further information, please visit:
http://isopt.net/index.php

Breaking into your brain

Imperial College London will host an event entitled 'Breaking into your brain' on 14 March 2013 in London, United Kingdom.

The brain is the most complex organ in the human body. It is the seat of intelligence, the interpreter of the senses, the initiator of body movement, and it controls our behaviour. For centuries, scientists and philosophers have been fascinated by the brain, but until recently they viewed it as nearly incomprehensible. Over the last 10 years, however, thanks to the accelerating pace of research in neurological and behavioural science, as well as the development of new research techniques, scientists have learned more about the brain than in all previous human history.

The event will be an opportunity for attendees to discuss computing, physics and engineering methodology aspects of brain research.

For further information, please visit:
http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/eventssummary/event_9-10-2012-14-35-36

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