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Special feature:

Knowledge beyond frontiers: cross-border science and innovation

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# research\*eu

## RESULTS MAGAZINE

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## Working together... to break barriers

The featured theme for this issue of *research\*eu results magazine* is 'Knowledge beyond frontiers' and focuses on cross-border science and innovation.

Advances in science and technology have always crossed and broken through barriers, from shattering illusions about the relationship between the Earth and the Sun to physically breaking out of the Earth's atmosphere into space. The projects funded by the European Research Council (ERC) today are even called 'frontier research'.

But science also advances by sharing knowledge, and national borders can act as barriers to this. Researchers can learn from each other and advance their studies by travelling to meet and work together, and research funding can be more effective if it combines a 'critical mass' of expertise from different countries and avoids wasteful duplication of work. It is also vital for the European Research Area to benefit from expertise and cooperation even if it lies outside the European Union.

That is why cross-border exchange and cooperation is so important to scientific research.

Sometimes it is through collaborative research projects of the kind that make up the majority of the Seventh Framework Programme (FP7), such as the NUTRIMENTHE consortium which brought together researchers from Belgium, Germany, Hungary, Italy, Poland, Spain, the United Kingdom from the EU with those from the United States, and which is featured on page 6.

Another way cross-border research can be encouraged and facilitated is through exchange programmes and scholarships, as exemplified by the Marie-Curie scheme, funded under FP7. Three of these projects — STSGA, Psychgene and 'Modular networks' — which extend these exchanges of knowledge outside the borders of the European Union, are then featured from pages 7 to 8.

As well as these featured articles, we also have our regular biology and medicine section. The NAD and Adprogres projects are both working on innovative investigations of Alzheimer's disease, a growing problem in Europe's ageing population.

The top story in the energy and transport section looks at the HAVEit project, which puts us on the road to more automated, and ultimately safer, vehicles. Their new approach focused on automation during extreme driving situations — in which drivers are often most at risk of having an accident — such as negotiating road works or while stuck in stop-and-go traffic.

More feature articles on the Catiemon and 'Central Loco' projects then highlight research's role in building better cross-border networks for transport.

The headline story in our environment and society section considers aquaculture as a complement to the fishing of Bluefin Tuna — in the same way as we already produce sea bream, sea bass, turbot and salmon — in order to protect disappearing fish stocks.

Our IT and telecommunications section starts with a look at how European scientists have prepared the ground to make ultra-high-speed broadband networks a reality for many more Europeans. More affordable optical fibre networks could bring huge economic gains.

Meanwhile, our industrial technologies section ends, appropriately, with a spotlight on how nano-crystals can overcome — literally — barriers in nano-electronic applications. The project, involving cross-border exchange with a Swiss university, has demonstrated the application potential of nano-crystal-mediated tunnelling for molecular electronics.

The issue ends with our summary of events and conferences in the field of *research* and technology for the next month.

We look forward to receiving your feedback on this issue and on the *research\*eu* publications in general. Send questions or suggestions to: [cordis-helpdesk@publications.europa.eu](mailto:cordis-helpdesk@publications.europa.eu)

The editorial team



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## BIOLOGY AND MEDICINE



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## Eat fish, build up brainpower

*Can pregnant women help boost their children's brainpower by eating fish? The findings of a study, presented in the American journal of clinical nutrition, show how children born to women who consumed more fish during their pregnancies demonstrated improved outcomes in tests for verbal intelligence, fine motor skills and pro-social behaviour. The results are one outcome of the Nutrimenthe<sup>1</sup> project, which was funded under the EU's Seventh Framework Programme (FP7) to the tune of EUR 5.9 million.*

Oily fish is the leading source of long-chain omega-3 fatty acids such as 'Docosahexaenoic acid' (DHA), a key structural component of cells and, in particular, the cell membranes of the brain. The European Commission supports health claims that DHA 'contributes to the normal brain development of the foetus and breastfed infants and to the normal development of the eye of the foetus and breastfed infants'. (EFSA Journal 2011;9(4):2078)

In the Nutrimenthe study, the researchers investigated how fish mediate the effect on brainpower. The project partners focused primarily on polymorphisms in the 'Fatty acid desaturase' (FADS) gene cluster that codes for the enzymes delta-5 and delta-6 desaturase involved in the synthesis of omega-3 and omega-6 fatty acids.

Using blood samples taken from more than 2000 women at 20 weeks of pregnancy and from the umbilical cord at birth, researchers assessed omega-3 and omega-6 fatty acids and the genotyping of 18 FADS single nucleotide polymorphisms. The team supplied omega-3 and omega-6 fatty acids to the developing child by placental transfer via the umbilical cord. How maternal and child FADS

genotypes impact the levels of these fatty acids had not been investigated until now.

Dr Eva Lattka from Helmholtz Zentrum München, the German Research Centre for Environmental Health, and her team discovered how polymorphisms in the FADS gene cluster affect fatty acids in women during pregnancy. According to the researchers, the composition of fatty acids in cord blood needs maternal and child genotypes, such that maternal genotypes are primarily associated with omega-6 precursors, and that child genotypes are mainly linked to omega-6 products. They also found that the DHA amounts were equally associated with maternal and child genotypes.

'There is more contribution to omega-6 fatty acid synthesis by the foetus than previously expected; DHA levels are dependent on both maternal and child metabolism,' Dr Lattka says. 'DHA supplied by the mother might be very important.'

In a previous study, researchers had found that consumption of fish during pregnancy is associated with the child's verbal intelligence quotient (IQ) at eight years of age, but what

does fish have that mediates the effect? While the study identified how eating fish is associated with maternal levels of DHA, no data has emerged on whether maternal DHA levels are directly related to outcomes in children. The NUTRIMENTHE project, which is expected to end in 2013, will work at resolving this issue.

The NUTRIMENTHE partners hosted a symposium called 'Nutrition and cognitive function' at the European Nutrition Conference in Madrid in late October 2011.

Researchers from Belgium, Germany, Hungary, Italy, Poland, Spain, the United Kingdom and the United States are part of the NUTRIMENTHE consortium which is coordinated by the University of Granada in Spain.

1 'Effect of diet on the mental performance of children'.

Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE).  
Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 23493



## Genetic architecture unravelled

*Novel software packages have the power to tease out genetic interactions and genetic architecture much more accurately than the current state of the art.*

Are genes acting more or less independently or are there complex interactions creating systematic patterns that science does not know about? Scientists traditionally believed that genes act largely independently of each other, although molecular biology had been showing some complex gene networks that had not yet been fully unmasked. More recent research has revealed surprising results in genetic architecture that cannot be ignored.

The EU-funded STSGA<sup>1</sup> project investigated such new discoveries through statistical experiments, seeking to improve on classical methods of study. These experiments are important in answering questions in biology, from evolution and population variation to animal and crop improvement. They

also looked at the ability to predict selection limits and avoid unwanted side effects of artificial selection.

To achieve its objectives, the project documented dynamically relevant parameters, combining statistical models with process models in order to improve understanding of genetic architecture. It also examined trait values in subsequent generations within populations subject to controlled artificial selection. The project then looked at 'quantitative trait loci' (QTL) mapping data. The latter involves molecular-marker-based information relating to how differences at particular locations in the genome affect certain traits.

STSGA successfully developed software that detects genetic interactions (epistasis) that may hold

important evolutionary implications. The project team used this information to analyse QTLs that affect the size of bones and internal organs in mice, demonstrating regular patterns of gene interaction.

The project also developed a statistical modelling framework for estimating genetic architecture from artificial selection responses. This can be used to describe different genetic architectures. This method is also available in a newly developed software package, facilitating more comprehensive research in this direction in future.

In short, these results and software packages are expected to form the basis for many research publications over the coming years and explain genetic architecture much more accurately. The impact of this research on ageing and disease may turn out to be profound.

The project was coordinated by the Universiteit i Oslo in Norway.



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1 'Statistical tools for studying genetic architecture'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace/search/offers/6819>



## Studying mood from a genetic point of view

*An EU study on the inheritance of major mood disorders has linked scientific research across Europe.*



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The Psychgene<sup>1</sup> project has set a number of specific objectives for research into DNA aberrations in people suffering from mood disorders. These include schizophrenia (SZ), bipolar disorder (BP) and major depression (MD).

Researchers in Denmark and Iceland are conducting a genome-wide 'Copy number variant' (CNV)

association study for the three mood disorders. CNVs are alterations in a genome's DNA make-up that leave a cell with an abnormal number of copies of one or more sections of the DNA.

Hosted at Iceland's deCODE genetics, the study samples were made up of 2 400 affected individuals (800SZ, 600BP and 1000MD) and 20 000 controls. Rare and recurrent CNVs conferring a high risk of SZ have been identified, as have common 'Single-nucleotide polymorphism' (SNP) variants. SNPs are different from CNVs in that they differ between chromosomes in an individual, not within the same DNA sequence.

Scientists from the Research Institute of Biological Psychiatry

(RIBP) of Copenhagen University Hospital and the Centre for Biological Sequence Analysis (CBS) at Denmark's Technical University have investigated disease-specific candidate genes in an Icelandic sample. In testing for association with the respective disorders, all associated genes and CNV regions were combined in a biological network analysis. To date, Psychgene researchers have yet to identify a clear biological pathway based on the results.

In studying these disorders, endophenotypes for associated CNVs and SNP markers must also be taken into consideration. This psychiatric concept places behavioural symptoms in more stable phenotypes with a clear genetic connection. The researchers investigated CNVs relating to factors like month of birth, age at onset, family history, mode of inheritance, cognitive functioning and treatment response.

Psychgene partners have also studied gene expression in lymphocytes derived from CNV carriers. Work here is ongoing as a bigger sample is needed to observe expression differences for genes outside the CNVs.

Project results have been published in the journals *Nature*, *Human Molecular Genetics* and *Molecular Psychiatry*, with others under review or being prepared for submission.

The project was coordinated by the Islensk Erfdagreining EHF in Iceland.

1 'Copy number variation and endophenotypes in psychiatric disorders'.

For further information:  
<http://www.psych-gene.eu/>  
 Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace/search/offers/6855>

## BIOLOGY AND MEDICINE



### Modules encourage 'survival of the fittest'

*Many scientists think that the functions and structures in our bodies behave like modules, each a separate unit that can be linked to one another. This arrangement has significance in the way humans have evolved and may be able to explain how complex we have become.*

The human body is incredibly complicated. At every level, structures and functions have developed side by side, each maintaining their independence yet able to coordinate with other units.

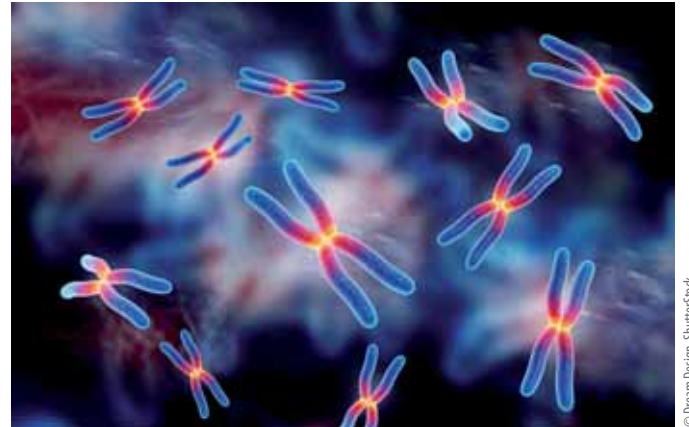
Evidence for modularity is mounting and stretches across genes, functions and structures. Different proteins, for example, have a common structure. However, each type of protein has extra building blocks so different molecules can have a specific function.

As far as evolution is concerned, modularity allows changes in one structure to occur without disturbing other units. This type of organisation would also make it easier for other combinations of modules to evolve.

The appropriately named Modular networks<sup>1</sup> project looked into just one of the aspects of modularity — genes that regulate developmental processes. With the help of EU funding, the scientists investigated how modularity can occur and facilitate the development of particular gene activity patterns.

The researchers ran computer simulations of the evolution of gene regulatory networks. They then analysed many thousands of gene circuits to investigate how different structural features can crop up, especially when an organism is able to change its physical appearance, or phenotype, when environmental changes occur.

Their results provide explanations for how living beings acquire a



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standardised unit-based organisation. Furthermore, they show how modularity facilitates the evolution of new functions through the combination of modules.

The research of the Modular networks team has far-reaching significance in evolutionary studies. Not only does it explain how living beings can operate with a modular arrangement, but it also shows how they can adapt to a changing environment. Moreover, it can shed new light on

developmental systems and help explain why they are so intricate.

The project was coordinated by the Universität Zürich in Switzerland.

- 1 'Topological and functional modularity in biological regulatory networks'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
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## Getting down to the molecular level of Alzheimer's disease

*A European project is investigating the biochemistry of Alzheimer's disease. The roles of proteins and their mutants, inflammation and damaging reactive oxygen species are coming together to complete the molecular jigsaw of this distressing condition.*



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A small peptide molecule, just one tiny strand of amino acids, is the main constituent of the damaging plaques found in the brains of Alzheimer's disease (AD) patients. Amyloid beta (Abeta) peptides make up the large destructive masses of amyloid deposits in the brain.

Recent research has suggested it is the intermediates to these amyloids that cause the dysfunction of the nerve cells, not the large aggregates themselves. Boosting this theory, small molecules (oligomers) of Abeta have previously been found to cause degeneration of the links between nerve cells (synapses).

The EU-funded Adprogres<sup>1</sup> project is investigating how Abeta peptides behave biochemically to induce this neurodegenerative chaos. Interaction of Abeta molecules with the boundary membranes and plasma membranes of nerve cells and at the synapses where the neurons connect has so far been poorly understood.

The scientists also probed the action of a mutant Abeta molecule known as Ab10Para. Interestingly, this modified molecule blocked the formation of toxic oligomers and inhibited damaging 'Reactive oxygen species' (ROS) formation, thereby causing less oxygen stress.

The research included an investigation of the 'Receptor for advanced glycation end-products' (RAGE). Certain biochemical activity by RAGE is thought to instigate pro-inflammatory gene activation and has been implicated in other diseases like diabetes type 2 as well as AD.

A protein, 'Thioredoxin-interacting protein' (TXNIP), has been found to mediate RAGE function. The project scientists found that there is a glut of TXNIP in mice with AD, implicating a role for this protein in the development of AD even further. Further research is planned before the end of this project, notably on

the roles of both RAGE and TXNIP in the development of AD.

AD is responsible for a huge social and financial burden. The Adprogres project is continuing to unravel the molecular cascades responsible for the disease — a huge step towards discovery of therapies to prevent the development of the disease.

The project was coordinated by the Centre national de la recherche scientifique (CNRS) in France.

- 1 'Alzheimer disease progression: Molecular studies of Abeta amyloid peptides aggregation and trafficking in neuronal cells'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
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## Unravelling gene expression for binding proteins

*Better understanding of protein-protein interactions and binding holds the promise of opportunities to develop targeted cancer therapies.*

MAL and MKL2 are two protein-coding genes, while 'Serum response factor' (SRF) regulates the expression of immediate early genes, genes controlling cell adhesion and migration and the expression of many muscle-specific genes.

Exclusive binding of MAL and MKL2 co-activators enables differential regulation of expression of SRF action. The activity of MAL and MKL2 is controlled through regulated interaction with G-actin, which is a subunit of microfilaments that are found in the cytoskeleton. It has been shown that depletion of G-actin results in the accumulation of MAL in the nucleus, whereas binding inhibits MAL nuclear import and transcriptional activity.

The SRF cofactors<sup>1</sup> project aimed to enhance understanding of how G-actin binding controls all these events. The original objectives were to develop a system to track MAL in real time and study the interactions between MAL and actin and between MAL and SRF in live cells.

MAL senses the G-actin levels in the cell with a so-called RPEL domain (a G-actin binding element). Studies revealed that RPEL1 and RPEL2 peptides bind to actin for the most part through hydrophobic interactions.

To test the validity of the results obtained, project partners developed disruption mutations to interfere with MAL-actin binding. Providing support for the original model, results showed that all



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mutations caused at least partial MAL-deregulation.

SRF cofactors researchers used 'Forster resonance energy transfer' (FRET) to monitor MAL-actin interaction during signalling. In fixed cells, FRET was observed between the two proteins MAL-GFP and mCherry-actin.

Since MAL is implicated in cell movement and metastasis, the project's results encourage further efforts to gain more knowledge about MAL-actin

interaction. This pathway could well prove useful in developing new cancer therapies.

The project was coordinated by Cancer Research UK in the United Kingdom.

1 'Cell Biology of SRF cofactors'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
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## The invasion strategy of bacteria

*Pathogenic bacteria possess a full arsenal of weapons against the cells they invade. One of the most potent and crucial for initiation of an infection is that of being able to stick to the host's cell surface proteins.*

The molecules responsible for this coup are called adhesins. Research has recently uncovered a new family, the 'Trimeric autotransporter adhesins' (TAAs), in gram-negative bacteria. This group of bacteria includes many pathogens including *Escherichia coli* and other gut-inhabiting microbes.

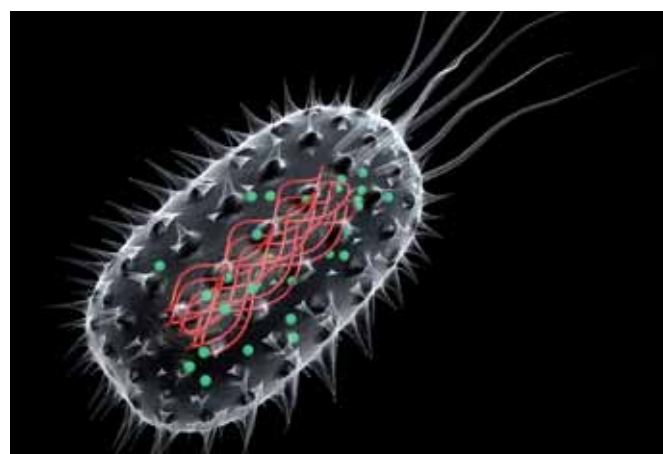
The molecular organisation of TAAs follows some surprisingly simple basic building rules. They have a head and a stalk made of building blocks that can be varied and repeated, probably evolved to fit with a specific host.

The aim of the recently completed European Trimbat<sup>1</sup> project was to investigate the structure and

biochemistry of the TAA family. As the formation of a secure landing and adhesion platform is key to any successful invasion, detailed knowledge of their initiation and building structure would be important for drugs and vaccines hoping to stem infection.

The Trimbat team first selected a base containing the YadA protein, and four different stalk lengths. In line with the modular nature of the invasion platform, they then chose a variety of heads including the so-called Cherry-tag and 'Maltose binding protein' (MBP).

The researchers successfully designed and expressed hybrid TAAs for *in vivo* studies of the mechanism and structures



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involved. Also, by engineering MBP, the folding rate of the protein was slowed down, rendering the YadA head domain larger than normal in the bacteria's extracellular space, which made study of its structure easier.

Once the structure of TAAs is fully understood, the next step is to design drugs and vaccines that have the right configuration to prevent adhesion to the host and therefore stop the first steps of colonisation. The alternative is to

use engineered super-adhesives where needed, perhaps to anchor beneficial bacteria.

The project was coordinated by the Helsingin Yliopisto in Finland.

1 'Trimeric Bacterial Autotransporters'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
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## BIOLOGY AND MEDICINE

### A new tech approach to Alzheimer's

*More than 3 million people across the EU have Alzheimer's disease: 1 in 20 are over 65, and this rises to 1 in 5 over the age of 85.*

The NAD<sup>1</sup> project is working to provide nanoparticles (NPs) engineered specifically for diagnosing and treating this common form of dementia.

The team of researchers is pursuing a 'theranostic' (therapeutic and diagnostic) approach by targeting the 'Amyloid beta' (Abeta) peptide, the pathogenic agent of Alzheimer's disease (AD). Detection and breaking up of the Abeta plaques followed by their removal is a potential therapy for this distressing disease.

Scientists are testing how NPs activated by certain molecules interact with various forms of Abeta peptide and cross the 'Blood-brain barrier' (BBB), as well as how they perform with screening contrast agents.

In work already completed, NAD researchers have established

protocols for amassing Abeta peptides. Ligands, molecules used for attaching to a biomolecule as a signal triggering substance, have also been selected and chemically modified for work with NPs.

Studies demonstrated that, in the form of liposomes, 'Solid lipid nanoparticles' (SLNs) or polymeric nanoparticles, NPs decorated with ligands can bind with Abeta peptides. The use of SLNs constitutes a new approach to drug delivery. The NAD team linked ligands to NPs to study the crossing of the BBB, with *in vitro* BBB models showing that NPs decorated with selected ligands can cross the barrier.

NPs were manufactured for use in screening by 'Magnetic resonance imaging' (MRI) or 'Positron emission tomography' (PET) techniques, while



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*in vitro* and *in vivo* tests were used to assess their relevance and suitability. Studies of physico-chemical and bio-compatibility features of NPs revealed stability for long periods and no relevant cytotoxic effects.

Artificial and cellular models will be used to improve and fine-tune the physical stability of NPs, Abeta binding, biocompatibility and BBB crossing. NP efficacy will also be evaluated in rodent models of AD.

As the project is not due to finish until 2013, work will continue to focus on developing new therapeutic and diagnostic nanotechnology-based

tools to help healthcare agencies and patients to treat AD.

The project was coordinated by the Università degli Studi di Milano-Bicocca in Italy.

1 'Nanoparticles for therapy and diagnosis of Alzheimer disease'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanosciences, nanotechnologies, materials & new production technologies'.  
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### At the compartment boundaries of the hindbrain

*An EU-funded project has just completed research on how the hindbrain works. The work promises to shed light on the control of vital, yet unconscious body functions like breathing and swallowing.*

The brain is divided into three major areas: the 'civilised' forebrain, and the more 'primitive' midbrain and hindbrain. Aspects of control of the hindbrain have so far remained uncertain, but the work of the MCAHBC<sup>1</sup> project has helped to fill in some of the gaps.

Each section of the brain is divided into compartments, each being surrounded by so-called boundary cells. Previous work has shown that cells at the boundaries of brain compartments in certain regions play a large part in organisation. Researchers investigated whether boundary cells around compartments of the hindbrain also have a role in control.

Using zebrafish as a model, project workers researched the formation as well as behaviour, fate and role of boundary cells in the hindbrain. Using genomic techniques, they mapped a stretch of genetic material, 'rfng', known to be involved in regulation.

The team used a combination of cell response to chemical staining, histochemistry, and time-lapse microscopy to unravel the gene control mechanisms. Moreover, the studies were designed to identify what genes were responsible for stem cells (undifferentiated cells) in the area becoming boundary cells and then being able to divide and proliferate.

The results give a promising insight into nervous system control. Interesting cross-talk or interaction was identified in the key signalling pathway known as Eph. This pathway is very important generally in most animals and is even implicated in the development of some cancers.

The significance of this research promises to be very diverse. Stem cell research is cutting edge and it appears that hindbrain boundary cells are an appropriate biological model to study stem cell dynamics and differentiation in central nervous system development.

The project was coordinated by the Medical Research Council in the United Kingdom.



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1 'Molecular and cellular analysis of hindbrain boundary cells'.

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## The balancing act of appetite and burning fat

*Obesity is a major health problem with severe human and economic implications. One promising research avenue is to unravel the biochemistry of how the body balances its energy requirements.*



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A staggering 8% of health costs in Europe are due to obesity-related diseases; genetic, socio-economic and environmental factors can contribute to an individual being either overweight or underweight. The EU-funded 'TOR and neurogenesis'<sup>1</sup> project has just finished investigations into the influence of the central nervous system (CNS) on weight gain.

As the control centre for energy balance throughout the body, the brain

must be able to pick up signals from the CNS through a variety of sensory inputs. The hypothalamus receives information on the balance between energy from stores such as fat cells and energy on tap from food recently eaten. Signals from this area of the brain regulate body weight and food intake.

Sensor mechanisms that gauge levels of 'Adenosine triphosphate' (ATP) — the cell's molecular energy

store — also signal to the hypothalamus. A fuel-sensing mechanism, the 'Mammalian target of rapamycin' (mTOR) signalling cascade, is implicated in integrating information about the hormones leptin and insulin, which are involved in energy balance and nutrient signals.

The project team hypothesised that a cell-signalling protein, 'Ciliary neurotrophic factor' (CNTF), may be involved in hypothalamic control. This small molecule, a so-called cytokine, can reduce weight even during diet-induced obesity. Interestingly, weight loss continues due to this appetite controller even after the therapy has been discontinued.

The TOR and neurogenesis researchers have found that more CNTF means greater activity for mTOR in the rat hypothalamus. Furthermore, mice with defective mTOR signalling do not respond to CNTF. Future research will focus on what types of cells are activated in the

hypothalamus during CNTF therapy and whether mTOR signalling is needed for long-term action of CNTF.

The project's research has far-reaching significance as there is a distinct lack of efficient anti-obesity treatments. Targeting the biochemical nuts and bolts of appetite control and energy balance promises to deliver pharmaceutical answers to obesity.

The project was coordinated by the Institut national de la santé et de la recherche médicale (INSERM) in France.

- 1 'The role of the mTOR signaling pathway in neurogenesis and its implications for the regulation of energy balance'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace/search/offers/6629>

## Constant regeneration is skin-deep

*An EU-funded project has made a major research breakthrough into how skin regenerates. Their findings have shed light on how the whole process manages to be so robust and resistant to error.*

Skin is a complete organ. It protects us from the ravages of invasion by pathogens, extreme temperature and water loss. Moreover, it feels, breathes, gets

rid of waste, and grows. It must grow rapidly and constantly as there is constant shedding of the dead (terminally differentiated) skin cells at the surface.

Regeneration every 21 days depends on a layer of epidermal stem cells as yet undifferentiated into their final form. In order to bring about this transformation of stem cells, there are several signalling pathways that control and regulate the processes involved.

The 'Chromatin in skin'<sup>1</sup> project took human epidermal stem cells and stimulated them to develop *in vitro*. While the process was in full swing, the scientists used a technique called 'gene silencing' by optimally introducing chromatin factors (nuclear material). When a gene is silenced, it does not do its job, which in itself identifies the role of that gene.

The project was very successful. The role of no less than 332 chromatin-related factors was determined and 5000 data points analysed to determine which genes were being expressed and when. This led to the discovery of

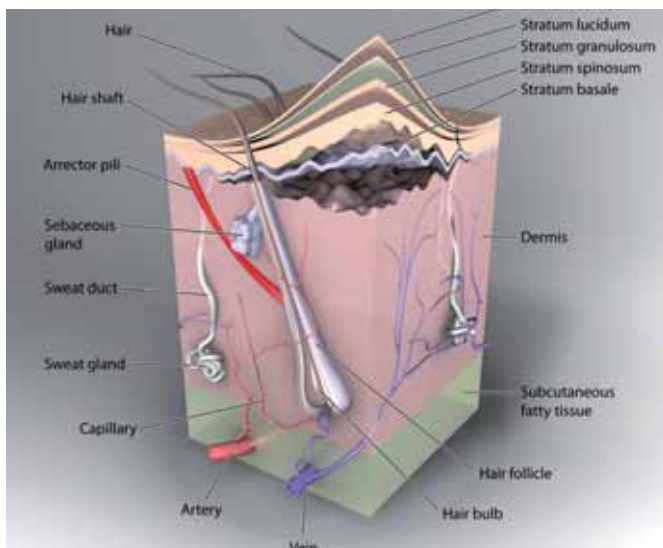
two functionally connected epigenetic self-renewal mechanisms that cause changes in skin renewal through means other than alteration of the DNA.

The significance of the research for fields like skin cancer is obvious. Mechanisms behind stem cell development will also help to explain the wonders of our intricate yet virtually foolproof maturation and regeneration systems.

The project was coordinated by Cancer Research UK in the United Kingdom.

- 1 'Deciphering the role of chromatin in epidermal stem cell biology'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace/search/offers/6646>



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## ENERGY AND TRANSPORT



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# Assisting drivers, saving lives

*Every year, Europeans drive off on their summer holidays in ever-safer cars, but traffic accidents remain a tragic part of driving. European researchers and engineers are contributing to the development of highly automated vehicles to avoid accidents, increase fuel-efficiency and make being on the road less stressful and more comfortable.*

More than 35 000 people are killed in around 1.5 million accidents on Europe's roads each year and, for every death, there are an estimated 4 permanently disabling injuries, 10 serious injuries and 40 minor injuries. Although deaths have been reduced by the introduction of safety features, from seat belts to airbags and better-designed crumple zones, most of the focus until now has been on mitigating the effects of a crash rather than avoiding one. But an emerging group of automotive technologies that use computer, sensor and actuator systems to assist and even take over driving from the driver aim to prevent accidents in the first place.

Already in use in some vehicles, 'Advanced driver assistance systems' (ADAS), as they are known, range from night-vision dashboard displays to collision-avoidance systems that alert drivers to obstacles on the road. Now researchers and engineers have designed a scalable architecture to implement ADAS for some of the most critical aspects of driving as a key step towards highly automated vehicles. Perhaps most importantly, they are implementing it in such a way that drivers will experience the benefits of increased safety, comfort and efficiency from automation while still being in control. Some of the features could be in use commercially within five years.

'Many drivers dislike the idea of automation; they fear they will no longer be in charge of

the vehicle. What we are proposing gives them a choice,' explained Reiner Hoeger, the director of engineering governance at the Automotive Systems and Technology department of Continental Automotive in Germany.

Dr Hoeger coordinated the EU-funded HAVEit<sup>1</sup> project, overseeing a team of researchers and engineers from 17 universities, research institutes and companies, including Volvo Technology, Volkswagen and Continental, which have set several important milestones on the road to more automated, and ultimately safer, vehicles. Their approach focused on implementing a high degree of automation during extreme driving situations in which drivers are often most at risk of having an accident, such as negotiating roadworks or while stuck in stop-and-go traffic.

Using existing sensor and actuator technology combined with onboard computers and new algorithms, the system lets drivers select between three automation modes which the computer dynamically makes available when road conditions permit. In the first mode, the driver steers the vehicle alone, assisted only in times of need by existing ADAS systems. In 'partly' or 'semi-automated' mode, the vehicle drives with longitudinal automation, so the driver no longer needs to accelerate or brake, much like a kind of advanced adaptive cruise control. When 'high automation' is activated,

lateral automation comes into play and the driver no longer has to steer.

### Keeping the driver in the loop

'Each mode has to be manually selected by the driver. It's not done automatically because it could lead to confusion, and the driver can always take over control from the system at any time,' noted Dr Hoeger.

However, unlike other approaches, the HAVEit system does not simply switch off an ADAS feature in the event of an impending and potentially critical situation. Instead, it adopts a progressive, step-by-step approach to transfer control back from the automated system to the driver.

'Every half second our system models the surroundings, interprets what's going on and creates an extrapolation for the next two seconds and decides whether the automated functions can handle it or not. If the system can't stay in control, for example if the line of sight is too short, then the driver is brought back into the loop,' the project coordinator explained.

A camera inside the vehicle continuously monitors the driver and the onboard computer determines their state of awareness. In the assisted and semi-automated modes, the driver's interaction with the vehicle, such as steering corrections, are also taken into account. If the system detects that the driver is drifting off to sleep, not

## ENERGY AND TRANSPORT

paying attention or becomes distracted, it will try to alert them through lights, sounds or vibrations to stay attentive. And, if there is no reaction, it will go into a fully-automated 'safe state', e.g. slowing down the vehicle, carefully pulling over to the side of the road and coming to a halt.

Through this novel optimum-task repartition between driver and computer, the system provides an ever-alert, virtual co-driver who can lend a hand when needed and, in either extreme or monotonous situations, take control. Given that an estimated 97% of accidents are caused by driver error, having a second, virtual set of eyes and hands behind the wheel is certain to make driving safer.

In one application, demonstrated at the project's final event in Sweden in June, the project partners showed how the system can help drivers negotiate roads that are under construction, where bollards, concrete barriers, multiple signs and limited clearance between obstacles and other vehicles can cause confusion and create a high-stress environment. In another test, the team showed how it can help relieve the monotony of being stuck in a traffic jam.

In stop-and-go traffic, for example, the system will take over much of the process of following the vehicle in front in a queue. It uses radar

and cameras to detect distances and accelerates and brakes as necessary to stay in the traffic flow, relieving the monotony for the driver. A similar degree of automation is possible on long stretches of highway with little traffic.

'Applications such as automated queue assistance could be the first to be implemented commercially in vehicles. All the demonstrated technologies have real value for drivers and could help make automated driving technology more widely accepted,' Dr Hoeger explained.

Getting drivers to accept automation systems in vehicles is one of the key obstacles addressed by the HAVEit project. Most drivers think they drive well, and do not like the idea of losing autonomy to a computer. However, if they can be shown that driving with a degree of automation in some circumstances will not only be safer but also more comfortable and less stressful, then they are more likely to accept the technology. The HAVEit project, which received funding from the EU's Seventh Framework Programme, proved that it can also save them money.

An active green driving application developed by project partner Volvo Technology and demonstrated on an hybrid bus equipped with sensors, digital maps and GPS satellite navigation, showed that, by 'coaching' the driver to take

certain actions and automatically preparing for road conditions in advance, fuel consumption can be reduced by up to 8%.

'We were careful to consult drivers throughout the project about what they thought of the technology and the applications and we tested it with them in simulators; the overall response was overwhelmingly positive,' Dr Hoeger noted. 'If you think back, there used to be a big debate about the benefits of cars with automatic versus manual transmissions, now many people happily drive automatics. I think we will see the same happen with the introduction of automation into vehicles: it will be increasingly accepted as people get more used to it and experience the benefits.'

The project was coordinated by Continental Automotive in Germany.

1 'Highly automated vehicles for intelligent transport'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communications technologies' (ICT).  
<http://cordis.europa.eu/marketplace> > search > offers > 6770



## No more missed connections

*After analysing connectivity among transport networks in Europe, an EU initiative is creating a powerful tool kit that fosters seamless travel across transport modes.*

With Europe melding into one giant entity on many levels, the importance of interconnectivity and ease of travel within the continent has increased sharply. The EU-funded Interconnect<sup>1</sup> project is studying how to make passenger transport more efficient and environmentally friendly. It is looking at integration, cooperation and competition as mechanisms to enhance connections among land, air and sea travel.

The project is defining the challenges and analysing EU and national policies on interconnectivity to propose solutions for improvements. It has already articulated the barriers to interconnectivity, policy documents and good practices, amassing a database of information from across the EU. The project then identified potential solutions, grouping them under themes such

as legal, organisational, infrastructure pricing, integrated ticketing and marketing. It has elaborated and analysed around 90 solutions so far on the basis of cost, user acceptance, travel time, comfort, advantages and safety. The solutions were presented in 2010 at the World Conference on Transport Research, and stakeholder feedback was taken into consideration to fine-tune a number of case studies on interconnectivity.

From 80 case studies, 12 were chosen to investigate solutions in real situations and identify challenges in interconnectivity. These included airports such as Glasgow and Edinburgh in the United Kingdom, as well as Frankfurt airport in Germany. It also included Lisbon ferries in Portugal, Amsterdam ferries in the Netherlands, Karlsruhe



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tram-trains in Germany, Milan railways in Italy and the tri-city area of Gdańsk-Sopot-Gdynia in Poland, among others.

After these cases are analysed, the emerging solutions will be tested in other locations and situations, with an upgraded model on how cutting-edge interconnectivity can operate successfully. This will lead to finalising the elaborate tool kit, complete with potential solutions to improve interconnectivity and ways to apply these solutions. The tool kit will be available on the project website and is set to reach

policy-makers in Europe, opening up a new era in transport.

The project was coordinated by the Transport Research Centre at Edinburgh Napier University in the United Kingdom.

1 'Interconnection between short and long-distance transport networks'.

**For further information:**  
<http://www.interconnect-project.eu>  
Funded under the FP7 specific programme Cooperation under the theme Transport.  
<http://cordis.europa.eu/marketplace> > search > offers > 6858

## ENERGY AND TRANSPORT



### Super sensors for a super rail system

*Railway systems in Europe are increasing their co-operation with each other. New sensors adapted for railway networks can improve safety and enhance monitoring, with a view to bringing European rail interoperability one step closer.*

With European integration, national rail transport systems are slowly but surely morphing into one super-network. While challenges such as interoperability and technical standards delay the consolidation of the system, progress is being made on many fronts.

The EU-funded Catiemon<sup>1</sup> project facilitated Union-wide rail co-operation and interoperability. It also helped to make European rail systems more cost effective.

Catiemon outlined challenges that must be overcome to achieve this objective, developing key performance indicators to monitor regulation and standards in the industry. It worked on a monitoring tool for 'Overhead contact

lines' (OCLs) to measure vertical contact force and friction force between the wagon's top part and the overhead infrastructure.

The project worked on sensor technology that facilitates rail monitoring tools. The challenge lay in ensuring that carbon strips glued to fibre optic sensors can detect how the antennae-like equipment makes contact with the overhead lines at high speed. Such technology can help differentiate between vertical contact hits (from the top) or horizontal contact hits (from the front). It also allows maintenance inspectors to detect deformities.

The project studied and tested the technology in real-life conditions, gleaned results that will



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help improve monitoring of railway transport across Europe, and bring interoperability one step closer. Its work resulted in new types of electromagnetic optical fibre sensors for the railway industry based on a technology known as Fibre Bragg Grating (FBG). These sensors have already been installed on railway lines and can withstand the high voltages of railway systems, as well as the harsh outdoor conditions.

This new technology and other novel equipment developed under Catiemon, called 'interrogators', hold much promise in advancing

unity in railway systems, improving railway management and enhancing safety.

The project was coordinated by Siemens AG in Germany.

- 1 'Catenary Interface Monitoring Coherent sensing technology for electrical railway infrastructure and rolling stock for interoperable cross boundary transportation'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 6746



### Loco on logistics

*Enhanced European and global trade requires a very strong logistics and transport sector that is up to date and operating at peak efficiency.*

An effort to collect valuable information from previous EU logistics projects and distribute it to businesses in need has borne much fruit in the sector, particularly in Central Europe.

The EU-funded 'Central Loco'<sup>1</sup> project promoted the dissemination and exploitation of EU research projects across the logistics and transport sector. The project successfully identified 120 research projects in logistics and intermodal transport, creating a database that could be browsed online.

Many businesses within the sector did not have the adequate knowledge or experience that the leading ones had, particularly in connection with safety and

security for different modes of transport.

Central Loco focused in particular on the Czech Republic, Hungary, Poland and Slovakia where the transport and logistics sector was deemed deficient. At its launch in 2005, the project established a website and hosted a workshop in Prague, Czech Republic, in the same year. The 'New telematic solutions in logistics' workshop hosted 10 presentations and related discussion.

In 2007, a second workshop took place in Budapest, Hungary, addressing 'Problems and new solutions in logistics with special regard to automatic identification'. It presented novel solutions in advanced logistics, focusing on a

global system powered by 'Radio-frequency identification' (RFID) and 'Electronic product code' (EPC) technologies.

Around 40% of participants represented business organisations in the field, well above the attendance rate expected for the business sector. The workshops also gathered stakeholders from the research and business environments, mostly from Central Eastern Europe, seeking to foster cooperation in novel ways.

Also noteworthy, the Central Loco conference organised by the Institute of Logistics and Warehousing (ILIM) took place alongside the prestigious Polish 'LOGISTICS 2006' congress. The conference tackled various logistics topics and attracted 600 participants instead of the envisioned 200. All these efforts were supplemented by regular newsletters to a growing audience of 5 500.



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Overall, the project created many opportunities for new projects to grow and for businesses to upgrade their services. It also encouraged relevant businesses to join the European Framework Programmes and raise their level to a truly international one.

The project was coordinated by the Instytut Logistyki i Magazynowania in Poland.

- 1 'Central European network for logistics competence'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 6869



## Induction technology heats up

*Large reductions in energy consumption across industries may be achieved through a new type of induction heater.*



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As the availability of energy and environmental considerations are increasingly becoming the dominating concerns in industry, researchers are investigating different ways of saving energy.

The EU-funded project Aluheat<sup>1</sup> has designed novel energy-saving technology for industrial production and other sectors. It developed technology to dramatically reduce energy consumption and life-cycle costs of large-scale

electro-technical components with very poor energy efficiency.

The project aimed to validate the feasibility of the new concept by building and testing a 200-300 kW aluminium billet induction heater in an industrial aluminium extrusion plant. The results of such a project are meant to facilitate the introduction of superconductor technologies in industry and elsewhere. The technology was based on

the ability of superconductors to carry loss-free 'direct current' (DC) combined with novel electromagnetic concepts to exploit the potential superconductivity.

Rigorous testing demonstrated that the new superconducting DC induction heater has a lower environmental impact than both conventional gas burners and 'alternating-current' (AC) induction heaters.

The project also looked into manufacturing the required conductor material, known as Magnesium diboride (MgB<sub>2</sub>), in the most optimised way. It tested large batches of the material and ensured that conductivity variances between batches remained small.

It then worked on cooling technology or cryosystem so that

the equipment can be cooled down faster in faulty situations. Although the manufacturing of the mechanical system was not finalised within the project period, Aluheat set the pace for perfecting the technology, and work has been continued by other stakeholders. If the technology is fully exploited, its implications on energy efficiency in industries may be profound.

The project was coordinated by Sintef Energiforskning AS in Norway.

1 'high efficiency aluminium billet induction heater'.

Funded under the FP6 programme 'Nanosciences, nanotechnologies, materials & new production technologies'.  
<http://cordis.europa.eu/marketplace/search/offers/6808>



## EU boosts neighbour's hydrogen research capacity

*Turkey's Scientific and Technological Research Council (Tubitak) has been active in research and funding for decades and boasts strong ties with the EU.*

The Institute of Energy within the Tubitak Marmara Research Center (Tubitak-MRC IE) has accomplished much valuable research in recent years and has attracted EU support to upgrade the centre's capabilities. The country's main government research organisation now has the opportunity to acquire infrastructure and know-how to significantly further research on sustainable hydrogen energy.

The EU-funded Hy-Prostore<sup>1</sup> project improved the centre's research capacity in hydrogen production, purification and storage. Such research is pivotal for developing sustainable energy systems in the future and requires solid infrastructure as well as joint research activities.

The project helped upgrade the centre's laboratory equipment and bring it up to date with European standards. It then encouraged participation in global conferences and workshops, helping the centre embark on EU projects under recent European Framework Programmes.

Hy-Prostore also helped EU countries and associated states to conduct joint research activities, combined with technical visits and information exchanges involving hydrogen laboratories abroad. This led to better use of human and capital resources. Training courses were also conducted to educate staff about hydrogen essentials and expand capabilities of research scientists.



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The conferences, partnerships and exchanges have helped develop powerful networks involving institutions in Turkey and Europe, both on a public and private level. Significant information exchanges emerged from the project, propelling the centre into the limelight and furthering Turkey's potential as a strong player in hydrogen technology. This bodes well for the industry and technology of a large country on Europe's doorstep.

The project was coordinated by Türkiye Bilimsel ve Teknolojik Arastirma Kurumu in Turkey.

1 'Improvement of the S&T research capacity of TUBITAK-MRC IE in the fields of hydrogen technologies'.

For further information:  
<http://www.tubitak.gov.tr>  
Funded under the FP6 programme 'International cooperation'.  
<http://cordis.europa.eu/marketplace/search/offers/6891>

## ENERGY AND TRANSPORT

### Trapping solar energy with silicon nanorods

*In order for consumers to help Europe reach its ambitious target of producing one-fifth of its energy from renewable sources, the cost of renewables has to come down. Fortunately, current research is showing that less-expensive solar panels may be closer than we thought.*

Photovoltaic panels made from thin-film silicon (Si) are much cheaper than their crystalline counterparts. However, they have not yet matched the efficiency of crystalline cells with respect to converting solar energy to electricity.

The EU is funding research aimed at improving the output of thin-film cells. One such project, ROD-SOL<sup>1</sup>, is investigating the potential of Si nanorods on a glass or metal substrate.

Nanorods offer the possibility of increasing light trapping and absorption. The challenge is constructing the rods in a cost-efficient manner. The ROD-SOL team of experts has been

evaluating a number of different techniques. Following simulations on the computer, prototype solar cells have been built using nanorods created with 'Chemical vapour deposition' (CVD) and 'Wet chemical etching' (WCE). Another prototype has been developed with a 'Transparent conductive oxide' (TCO) film.

Tests of the prototypes indicate encouraging improvements in efficiency. The ROD-SOL team has now turned its attention to defining the costs associated with using these technologies in a factory rather than a laboratory. If the economics prove attractive, consumers looking to go green will be able to opt for a viable solar energy alternative.



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The project was coordinated by the Institut für Photonische Technologien eV in Germany.

- 1 'All-inorganic nano-rod based thin-film solarcells on glass'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanosciences, nanotechnologies, materials & new production technologies'.  
<http://cordis.europa.eu/marketplace/search/offers/6732>

### Taking European aviation to new heights

*By providing a better description of the complex flows generated behind aircraft, European researchers are poised to make flying safer while at the same time giving a much-needed boost to airport capacity.*

The passage of air over and around an aircraft's wings produces special circulations known as wake vortexes. These vortexes, while pretty, are in fact dangerous to other aircraft since they can remain present in the

atmosphere for several minutes. The greatest risk is posed during take-offs and landings.

The Far-Wake<sup>1</sup> project looked to fill in gaps in previous research in an effort to provide improved

characterisation and prediction of wake vortexes.

Experiments were carried out using special equipment to generate and study wake vortexes in a controlled environment and complemented by computer-based simulations. Special attention was paid to the impact of engine and ground effects on wake vortex development. Attempts were also made to try to improve our understanding of how wake vortexes decay.

The Far-Wake team then tried to extract meaningful conclusions that could help the aviation industry better manage the threat associated with wake vortexes. In addition to real-time wake vortex forecasting, progress

was also made in speeding up vortex decay.

These findings will not only contribute to making aviation safer in Europe, but will also address the growing problem of airport capacity since it will be possible to reduce spacing between aircraft during take-offs and landings.

The project was coordinated by the Centre national de la recherche scientifique (CNRS) in France.

- 1 'fundamental research on aircraft wake phenomena'.

For further information:  
<http://www.lps.u-psud.fr/Colloques/NTCargese2006/>  
 Funded under the FP6 programme 'Aeronautics and space'.  
<http://cordis.europa.eu/marketplace/search/offers/6747>



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## Laser powering the future of viable power sources

*An EU-funded project is working to advance the field of laser-induced particle acceleration in plasma. Project results promise to have immediate application for nuclear fusion reactions.*

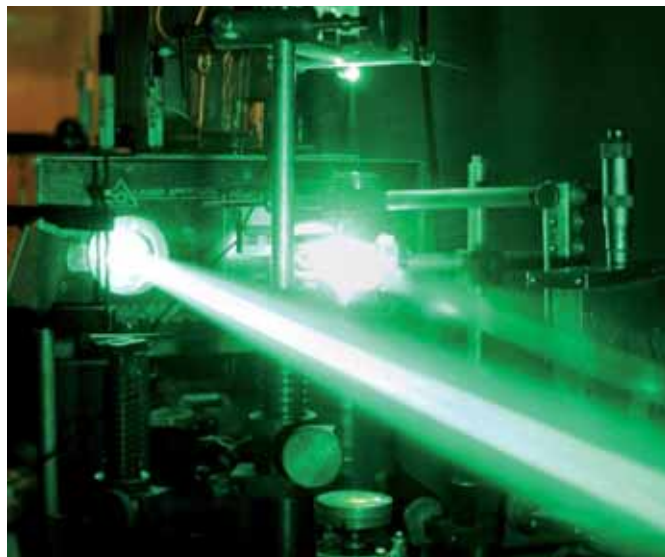
The ILP-ULTRA<sup>1</sup> project intends to characterise a broad array of laser plasma parameters

analytically, in large-scale numerical computer simulations as well as experimentally.

The project initially evaluated relatively intense ultra-short duration laser pulses interacting with solid targets, both with computer models and experimentally. The focus here was on defining optimum conditions for electron and ion acceleration.

Results such as those being produced by the project may bring ICF one step closer to becoming a commercially viable power source in the future.

The project was coordinated by the Centre national de la recherche scientifique (CNRS) in France.



The researchers also studied laser pulses of longer duration and higher energy, related to target acceleration applied to inertial fusion. Characterisation of laser-matter interactions could have significant impact on nuclear fusion reactions, in particular as related to heating of fuel ignition targets in inertial confinement fusion (ICF). ICF has not yet been useful in producing more energy than it consumes.

1 'Interaction of ultra-intense laser pulses with plasmas'.

Funded under the FP7 specific programme People (Marie-Curie actions). [http://cordis.europa.eu/marketplace > search > offers > 7382](http://cordis.europa.eu/marketplace/search)

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## Smarter membranes for better fuel cells

*As demand increases for energy and oil prices skyrocket, energy systems such as hydrogen and fuel cells must be improved. Achievements here will also help in attaining new energy and climate-change policy objectives.*

A breakthrough in the development of 'Proton exchange membrane fuel cells' (PEMFCs) requires major improvements in performances of the catalysts and protonic membrane, both key components of fuel cell material. Also, innovative solutions are needed to overcome limitations in membrane assembly and integration.

working to implant a catalytic network in the thin-film protonic membrane. This creative composition of materials renders a surface well suited to fuel cell technologies as it brings the membrane and pressing electrodes into direct contact. Researchers will add various functionalities to the material to make it 'smarter'.



Performance of the 'Membrane electrode assembly' (MEA) presented in polymer electrolyte membrane fuel cells is limited because of what takes place on the interface, between the catalytic layer and the membrane. The Smallinone<sup>1</sup> project aims to overcome this limitation by introducing an all-in-one membrane concept.

Initial work concentrated on synthesising basic materials for the Smallinone membrane, as well as developing volatile precursors efficient in depositing proton-conductive membranes with vacuum techniques. The potential of the precursors has been evaluated and various deposition techniques have been tested.

returned promising results, with the chemical structure of the precursors being retained intact. Other investigations into synthesis of catalytic membranes also showed the process to be effective.

achieve reduced assembly time and costs.

The project was coordinated by the Commissariat à l'énergie atomique et aux énergies alternatives in France.

The Smallinone project expects continuing work to achieve a reduction in material and fabrication costs, including a reduction in the concentration of platinum used without affecting its performance.

1 'Smart membrane for hydrogen energy conversion: all fuel cell functionalities in one material'.

Funded under the FP7 specific programme Cooperation under the theme Energy. [http://cordis.europa.eu/marketplace > search > offers > 6768](http://cordis.europa.eu/marketplace/search)

With a number of objectives guiding its work, project partners are

Experiments on the deposition of proton-conductive membrane

The techniques being used are promising for large-scale production and could facilitate the direct integration of fuel cells so as to

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## ENERGY AND TRANSPORT

### Better hydrogen storage

*There is currently no solid-state hydrogen storage material that meets all requirements for practical use in mobile applications. These include high storage density, optimal temperatures and operation heat, and high hydrogen loading and unloading speeds.*

The FLYHY<sup>1</sup> project is working on modifying the thermodynamics and reaction speeds of materials by substituting part of the hydrogen in high-capacity hydrogen storage materials — alane, borohydrides and 'Reactive hydride composites' (RHCs) — by halogens like fluorine, chlorine, bromine and iodine. The FLYHY approach aims to improve the properties of the storage materials, so that they function optimally under reaction temperatures suitable for use together with fuel cells.

Other objectives include a new approach to materials synthesis, increasing understanding of the synthesis process through better structural and thermodynamic characterisation and modelling, determining the special properties

of materials relevant for use in the tank, like compaction behaviour and thermal conductivity, and testing a prototype solid-state hydrogen storage tank.

FLYHY has studied whether the reaction enthalpy (a measure of a thermodynamic system's total energy) of either too stable or too unstable materials can be modified as desired while maintaining high storage capacity. Modified alane, borohydrides and RHCs were synthesised, but the work on alane was terminated since it proved to be unsuitable for the chosen approach. To obtain pure and modified stable and unstable borohydrides, new routes of wet chemical synthesis with high yield have been developed. These routes showed improved cost advantages



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compared to commercially available materials.

A comparison of life-cycle and fuelling costs of current hydrogen storage methods revealed that solid-state hydrogen storage is already competitive with compressed and liquid storage. This advantage comes with the proviso that the raw materials are produced by large-scale industrial suppliers rather than fine chemical suppliers.

If FLYHY project researchers can achieve further reductions in hydrogen release temperature, reaction kinetics and/or the cycling stability of candidate compounds, they will be able to produce a hydrogen storage material with a far more desirable capacity, as

well as a prototype tank based on that material. This would positively impact cost and performance competitiveness of the compounds with other storage alternatives.

The project was coordinated by the Helmholtz-Zentrum Geesthacht GmbH in Germany.

- 1 'Fluorine substituted high capacity hydrides for hydrogen storage at low working temperatures'.

#### For further information:

<http://www.flyhy.eu>

Funded under the FP7 specific programme Cooperation

under the theme 'Nanosciences, nanotechnologies, materials & new production technologies'.

<http://cordis.europa.eu/marketplace> > search > offers > 6762



### Discovering the driving force behind demand for cars

*The purchase of an automobile is one of the most important consumption decisions that many will make. Unique Cypriot datasets may hold the key to understanding consumer behaviour.*



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Many economists spend a considerable amount of time trying to fathom consumer behaviour: what, where and how consumers buy, or do not buy a particular product. With simple goods such as ice cream we know that people will purchase more when the weather is hot and choose a flavour they appreciate. Cars, however, represent a much more complex purchase. Besides a home, automobiles are often the largest item an average individual will purchase in their lifetime.

The EU-funded Dynadem<sup>1</sup> project is examining consumer behaviour behind automobile purchases. Over the years, economists have analysed the various factors that determine the final

decision to purchase a particular automobile. Important methodological advances in the 1990s have made possible the estimation of rich static demand models for such differentiated products. More recently, attention has shifted to dynamic aspects of consumer behaviour.

Historically, durable goods such as automobiles have posed a challenge for economists because consumer purchase decisions do not only depend on currently available factors, but also on future expectations and choices. Ice cream, for example, is a non-durable product and choices as to its selection are made based on current expectations and factors: the weather at the time, where the closest location for an ice cream is, and so on. The consumer's long-term future plans (say, for the next five years) do not enter into the equation. When

purchasing a car, however, this future time frame is an important factor for consideration.

Dynadem is exploiting a unique dataset that records every vehicle registered in Cyprus since 1970. As of 1987, the dataset also records transfers of ownership and an identification number for each vehicle's owner. This data will go a long way towards decoding consumer behaviour when it comes to automobile purchases.

The project was coordinated by the University of Cyprus.

- 1 'Dynamics of automobile demand'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> > search > offers > 6734

## Communication networking for airspace safety

*Communication activities improve airport workers' collaboration and allow current knowledge to be shared.*



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This ASAS-TN2<sup>1</sup> project concerned the new generation of 'Air traffic management' (ATM) systems supported by airborne applications. Focusing on the application of 'Airborne separation assistance systems' (ASAS) to increase

European airspace capacity and safety, it was primarily a communication activity.

The EU-funded project concentrated on the exchange of information relating to ASAS and

'Automatic dependent surveillance-broadcast' (ADS-B) applications, while getting air-orientated and ground-orientated people working together more closely. It did this by involving key players, creating discussion and communication forums and establishing a review group to develop guidance and recommendations.

The main result has been the sharing of current knowledge on ASAS/ADS-B and making recommendations for future activities related to its operational use. It is expected that these results will inform European actions, and allow European industry to plan their new product development strategies with greater optimisation.

Together with a document repository, forums were created and the project focused on delivering a yearly status on progress towards

the implementation of ASAS/ADS-B applications. Two-day events were held in five European cities and the number of participants grew each time, thus showing a measure of success. Study findings revealed that while the ATM community is relatively well covered, participation on the part of industry and airlines in particular is still very limited.

The project was coordinated by the European Organisation for the Safety of Air Navigation, based in Belgium.

1 'ASAS Thematic Network 2'.

Funded under the FP6 programme 'Aeronautics and space'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 6835

## Thrust into space

*Specific plasma-based thrusters may propel the human race into space much more efficiently than anything that has come before.*

Mankind has always dreamed of exploring space, and the dream is one step closer to becoming more of a reality with the development of advanced space plasma-based thrusters. The EU-funded HPH.com<sup>1</sup> project is designing advanced space plasma thrusters based on helicon-radio-frequency technology or more simply helicon antennae. Drawing on helicon plasma as a source of power, this technology promises to be much more versatile and cost effective than anything else so far.

The project team is conducting a feasibility study on using the plasma thruster to heat and decompose a secondary propellant. It is examining the possibility of developing a combined two-mode thruster that can operate in the low-thrust, high-efficiency plasma-mode, as well as a high-thrust,

low-efficiency, secondary-propellant, plasma-enhanced mode.

In its first year, project research studied thruster analysis and development to identify the main physical aspects required for a helicon plasma thruster. Studies in related physics investigated the source needed to achieve very high efficiency, power needs for ionisation, high-electron temperature and plasma acceleration.

The project has developed a new, innovative method to evaluate the coupled power and plasma evolution based on '3D Particle' computer code. Other codes are being developed for design of HPH.com for the design and optimisation of the thrusters, enabling detailed analysis of plasma behaviour.



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Thruster specifications have been undertaken to set the requirements for the design phase, opening up a world of possibilities for eventual space exploration. If more tests prove fruitful, as expected, a new way of reaching beyond our atmosphere may be found.

The project was coordinated by the Università degli Studi di Padova in Italy.

1 'HeliconPlasmaHydrazine. CombinedMicro'.

Funded under the FP7 specific programme Cooperation under the theme Space.  
<http://cordis.europa.eu/marketplace> >  
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## ENVIRONMENT AND SOCIETY



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## Breakthrough in Bluefin Tuna farming

*Bluefin Tuna is disappearing from the sea. Demand keeps prices high — which means people will keep fishing this species until there is none left. Obviously, this is an unsustainable situation. In Cartagena, in southern Spain, scientists from the EU's Selfdott<sup>1</sup> research project are investigating how to farm Bluefin Tuna. So every night in July they take a boat and go out to collect eggs from two cages containing 60 Bluefin Tuna.*

According to Fernando de la Gándara, the project coordinator: 'This project aims to make it possible to produce Bluefin Tuna in the same way as we already produce sea bream, sea bass, turbot and salmon: using aquaculture. But this doesn't mean the end of the Bluefin Tuna fishing; aquaculture will be a complement to fishing.'

In Malta, the day starts very early for Robert Vassallo-Agius, a biologist at the Malta Aquaculture Research centre. He is also working on the Selfdott<sup>1</sup> project. Every morning in July, he goes to the Bluefin cages to look for eggs, but last year he was not as lucky as his colleagues. There were not any eggs, so this year, he has made some changes: 'This year we brought the cages into a cove, into a small bay where we hoped to have less currents, but this year again we had few eggs compared to Spain, probably because temperatures did not rise quickly enough. This year was a quite cold year for sea water temperature and during what we think is the best egg-laying period for tuna in captivity, we had cold temperatures.'

Bluefin Tuna use light and temperature to know when to reproduce. They are also very sensitive to water quality. But that is not all. Mr Vassallo-Agius continues: 'Bluefin Tuna poses another

problem; it is a very big and delicate fish. So because of its size we can't handle it, we can't check it, we can't see what maturation stage it is at, like we do with sea bream, for example. And for this reason it causes another problem which is logistics; how to collect the eggs.'

Harvesting even small quantities of farmed eggs is really hard because Bluefin Tuna need special care all year round. So these scientists are being helped by private companies that were working with tuna even before this project started.

Antonio Belmonte, a biologist at Caladeros del Mediterráneo, says: 'We ensure that the fish have perfect living conditions and that every care is taken to avoid any kind of problem during the egg-laying period.'

Some of these eggs stay in Spain, and others go to France, Greece and Israel. Scientists use them to learn how to produce a full-grown fish, which is the next step of this project. Germany, Italy and Norway are also taking part.

Says Mr de la Gándara: 'There were fewer eggs being laid in Malta than here in Cartagena, but we have achieved the reproduction of Bluefin Tuna in captivity. So now that we have shown

that is possible, the next hurdle is breeding Bluefin Tuna larvae, and that will require a special effort.'

The challenge is ensuring the survival of the larvae. Last year, scientists managed to keep some of them alive for more than 70 days. Now they are hoping that some of them will grow to at least a kilo, which is very hard to achieve with Bluefin Tuna. There are all sorts of complex problems like stress and cannibalism, but they hope that with the right feeding, the problems will be solved.

Aurelio Ortega, another biologist, from the Instituto Español de Oceanografía, says: 'Bluefin Tuna grows very fast. This is why tuna have very high nutritional requirements. It needs a lot of energy, much more than other species that we are farming. So we have to give them very high-energy food compared with the food that we give to sea bream or sea bass, for example. But this is also a fish that lays eggs in salt water rather than fresh, so it needs very-high-quality water with high concentrations of oxygen.'

Scientists are optimistic about this project because in the past they have succeeded in breeding wild species in captivity.

## ENVIRONMENT AND SOCIETY

Mr de la Gândara continues: 'Bonito, which belongs to the same family as tuna, is smaller so it's easier to handle and with this species we had a huge achievement: for the first time in the world we closed the biologic cycle of bonito in captivity. That means that we get fish in captivity from parents that were born also in captivity.'

In Malta, Mr Vassallo-Agius' team succeeded in breeding amberjack, which also fetched high prices on the open market. These achievements show the way for the Bluefin Tuna. It is time to take them out of the sea. 'The immediate next step is to improve the larvae's survival. But at the same time in parallel we have to run towards producing a land-based facility where Bluefin Tuna brood stock can be held in captivity, so they can bring eggs in a better way than they do in the cages,' Explains Mr Vassallo-Agius.

The land-based facility for Bluefin Tuna will look like the amberjack farm in Malta. Here, the light and the water temperature can be controlled,

so that the fish live in ideal conditions for reproduction, which is crucial if farming them is to become a reality.

Mr de la Gândara says: 'We know the origins of farmed fish, we know what we are eating, and this is traceability. We know everything about a farmed fish. Also, farmed fish are of standard quality, so consumers who buy it know exactly what they are buying.'

Scientists have also been holding a series of blind tastings: the results are surprising. 50% preferred the taste of wild tuna, and 50% preferred the taste of farmed tuna. This is good news because the only way to supply markets with as much Bluefin Tuna as they want is via aquaculture, as it is done now with salmon or shellfish.

Mr Vassallo-Agius concludes: 'With all the effort that is taking place now on Bluefin Tuna, with everybody's input, and there are some very

good experiments going on with the eggs that are now produced in Spain, I think we will have some progress and maybe there will be some tuna aquaculture production in the near, not so distant future.'

The hope is that farming Bluefin Tuna will take the pressure off wild stocks — allowing them to breed in peace so that this species does not disappear from our seas forever.

The Selfdott project is being coordinated by the Instituto Espanol de Oceanografia in Spain.

- 1 'From capture based to self-sustained aquaculture and domestication of Bluefin Tuna, *thunnus thynnus*'.

Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE).  
Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 23633



## Trees boost sustainable agriculture

*Meeting the challenges of a changing climate and degraded natural resources requires a new and innovative approach to sustainable agriculture. One EU-funded project worked with struggling farmers in Africa and Central America to develop agro-forestry systems in a seasonally dry environment.*

The Funtree<sup>1</sup> initiative is studying 'Agro-forestry systems' (AFSs) and the factors affecting their adoption, or lack of, in two sub-Saharan sites, based in Mali and Senegal respectively. Results were compared with a third field site based in western Nicaragua. Use of a site based in Central America has enabled researchers to test the generality of the findings in seasonally dry environments.

Project partners study attributes of local tree species related to water-use efficiency and drought tolerance and their ability to fix atmospheric nitrogen in the soil. Researchers also investigate how attributes of the trees correspond with the capacity to provide firewood, timber, shade and fodder for livestock. Important constraining factors include the loss of agricultural land due to increasing salt levels in the soil and limited access to animal feed. Scarce forest resources have also been threatened by over-harvesting and the expansion of cropland.

Local residents possess a wealth of knowledge about their natural environment, which researchers used to help identify the traits and functions of different tree species. These include wood density, growth rate and size of fibres; the palatability of forage, the production of leaves, pods or fruits, and the nutrition they contain were also taken into consideration by the Funtree team. Scientists successfully identified 11 different uses for selected tree species, including animal feed, energy provision, and water conservation and erosion control.

Data collected during the project will allow scientists to create a portfolio of plant functional traits that can be used to help increase crop production by overcoming specific problems. These challenges include drought, soil erosion and lack of protection from sun and wind. Researchers are also developing a model that will enable the different components of seasonally dry livestock



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production agro-forestry systems to work together as efficiently as possible.

The success of the Funtree initiative has demonstrated what can be achieved when local farmers and EU scientists work together towards a common goal. The results will enable the most suitable trees to be grown in order to develop productive and sustainable agro-forestry.

The Funtree project was coordinated by the Stiftelsen Norsk

Institutt for Naturforskning in Norway.

- 1 'Functional diversity; an ecological framework for sustainable and adaptable agro-forestry systems in landscapes of semi-arid and arid eco-regions'.

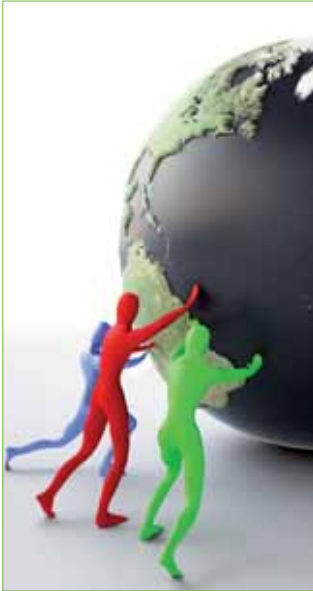
Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE).  
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## ENVIRONMENT AND SOCIETY



### Making inroads into tourism vs. immigration

*Both tourism and immigration involve movement of people and provoke strong human responses. Likewise, both phenomena also have an unusual dynamic between the northern and southern hemispheres that is well worth studying.*



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Immigration of people from troubled countries has tended to be from the south to the north, while much tourism has tended to be from the north to the south. This interesting paradox and society's perceptions are behind Migratourima<sup>1</sup>, an EU-funded anthropological study.

'Imaginaris' can be described as representational systems that mediate reality and form identities. They are important in building perceptions about other peoples and nations, although they are not necessarily accurate.

The study is examining how tourism and immigration with respect to Africa, Asia and Latin America are interlinked, what this tells us about multiculturalism, and how we see one another. The main hypothesis is that tourists from the north perceive the south in ways that seem disconnected from the present and more connected to an imagined past. With this in mind, the study is looking at how people in Belgium imagine tourism in Chile, Indonesia and Tanzania, and how Belgians see migration from these countries.

The research will employ a diverse approach, involving observation, interviews, archived research, and material from secondary sources (TV, advertising, press, cinema,

photography, and exhibitions). The ethnographic perspective will provide a close analysis of the cultural practices and social relations that produce or reproduce globally circulating imaginaries of mobility, and the implications of this for citizens.

The project is adding to existing research in two ways. First, imaginary ideas are put into practice, and the ethnographic method described above assesses how such activities, subjects, and social relations materialise and are enacted and encouraged. Second, the research analyses how widespread imaginaries and personal imagination about mobility are interconnected but contradict each other. The study is also establishing concrete links between the social sciences and the humanities, bringing together aspects of anthropology, sociology, psychology, history and geography.

Migratourima shows that research on tourism and migration — two very important issues of our time

— should not be limited to applied science but can contribute to social sciences in general. At the same time, the theory and findings generated by this case study will support policy-making, planning, and development within the EU.

Finally, Migratourima is set to bring mobility-related research increasingly to the centre of the social sciences, as well as moving academic inquiry closer to public interest.

The project was coordinated by the Katholieke Universiteit Leuven in Belgium.

- 1 "Routes, roots, and rumours: tracing migration and tourism imaginaries".

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> > search > offers > 6710



### Developing tools for sustainable urban design

*Sustainable urban design is giving people an alternative philosophy when deciding what their environment will look like. A European initiative is developing tools to realise the related urban planning and design development.*



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The philosophy behind sustainable urban design brings urban planning in line with the principles of economic, social and environmental sustainability. With over 80% of

the EU's population living in urban areas, green open spaces are at a premium, and their complete worth is often undervalued and unrealised.

The 'Visibility tools'<sup>1</sup> project is developing new methods and tools to evaluate environmental quality. Urban planners and architects have a limited selection of three-dimensional quantitative methods and tools to support them during the actual design development process. Most of the current state-of-the-art analysis methods relate to two-dimensional reality.

Visibility tools has developed three-dimensional visual analysis models and automated tools based on geographic information system technologies, in order to evaluate and balance urban environments relating to privacy and openness to the view. Visual openness to a 'view' is one of the main objectives in the sustainable development of urban areas adjacent to open spaces such as coastal regions or open green spaces.

The tools and methodology developed can be used by urban designers and architects alike during the urban design and development process in order to contribute to the development of sustainable urban environments.

The models developed as part of this project have been applied to

different case studies in the United States; preliminary findings and conclusions have contributed to urban design and promise to lead to initial guidelines that can be applied to sustainable urban environments and contribute to existing and future urban frameworks.

The Visibility tools project was coordinated by the Israel Institute of Technology in Israel.

- 1 'Towards sustainable urban design; developing automated visibility analysis tools to be used along the urban planning and design development process'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> > search > offers > 6698



## Tools for managing spills in the Arctic Ocean

*The Arctic region has already proved highly susceptible to climate change. Aiming to limit further burdening of this ecosystem, a new modelling system has been tested that forecasts the fate of pollutants discharged into the Arctic Ocean.*



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Recent events in Japan have highlighted the fact that no matter how prepared we may be, natural disasters can still cause the release of harmful contaminants into the environment. When this happens, it is imperative that we have the tools we need to help track and manage the impact of such episodes.

The GMS application<sup>1</sup> project focused on the environmentally sensitive region of the Arctic Ocean. The project, which received funding from the EU, brought together modellers and marine scientists from the EU and Newly Independent States.

Simulations were performed with the 'Generic model system' (GMS), which was developed during a previous collaboration. In addition to radioactive contaminants, 'Persistent organic pollutants' (POPs) and industrial pollutants such as heavy metals were studied.

Experts were invited to a workshop where information regarding the capabilities of GMS for tracking pollutants following their release into the Arctic region was shared through a number of case studies. The gathering culminated in a new era of cooperation among researchers in countries in the region.

These developments are being shared not only with the research community, but also with the

general public through a dedicated website. In addition, a book is to be published summarising the simulation results as well as implications for policy-makers and other stakeholders with an interest in protecting and preserving the Arctic Ocean.

The project was coordinated by the Nansen International Environmental and Remote Sensing Centre in the Russian Federation.

- 1 'Generic Model Simulations of spreading of marine pollutants in the Arctic environment during the 21<sup>st</sup> Century'.

Funded under the FP6 programme 'International cooperation'.  
[http://cordis.europa.eu/marketplace >](http://cordis.europa.eu/marketplace/search)  
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## Birds of prey for a healthy environment

*Birds of prey, also known as raptors, perform an important role by acting as environmental indicators. Their presence reflects a healthy ecosystem, while a decline in their numbers can signify contamination of the local environment.*

The Euraptor<sup>1</sup> project is developing a Europe-wide network for monitoring birds of prey. The initiative built on the success of the 'Raptor Ecotox' initiative (funded by the Intra-European Fellowship) by helping to secure the long-term viability of the European network. The consortium has also supported recovery plans for threatened species such as the lanner falcon (*Falco biarmicus feldeggii*).

A recent study at the University of Palermo in Italy has led to a greater understanding of the environmental pressures on the lanner falcon, something that will contribute to its recovery. Presence or absence of the species can be used as an indication of the condition of the local environment. The project has also

coordinated a special edition of the academic journal *AMBIO* concerning the monitoring of European birds of prey.

Researchers have conducted studies into contaminants in lanner falcons and their prey through fieldwork and the use of sampling techniques. Laboratory analysis is employed when a statistically significant number of lanner samples have been collected, something that takes time due to the birds' rarity. Samples have also been collected from peregrine falcons for comparative purposes.

Work carried out by the Euraptor initiative can contribute to greater biodiversity and improved environmental and human health. The creation and growth of a European network will help in the



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maintenance and recovery of raptor populations and their habitats, together with a reduction in chemicals threatening the ecosystem and human population. Euraptor will therefore aid environmental and human health policy-makers, environmental law enforcement bodies, and conservationists.

The project was coordinated by the Università degli Studi di Palermo in Italy.

- 1 'Monitoring with and for raptors in Europe'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
[http://cordis.europa.eu/marketplace >](http://cordis.europa.eu/marketplace/search)  
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## ENVIRONMENT AND SOCIETY

# Knowledge transfer for a better bio-economy

*European food products are sought after the world over. In order to maintain this position, however, the lines of communication between academia and industry need to be improved.*

With so many centres of research operating in the EU, it is important for companies and small to medium-sized enterprises (SMEs) with an eye to exploiting this research to be able to identify innovation and transfer this knowledge.

The EU-funded Knowledge2Innovation project was set up with this idea in mind; more specifically, the aim was to promote and improve academia-industry knowledge transfer in the agro-food sector. In order to achieve this, a set of practical, decision-support tools and targeted training materials were created. In addition, other relevant resources which could be of aid to researchers, industry and knowledge transfer professionals were identified and 'signposted' for further research and general attention.

The nine project partners from seven countries mapped out existing

resources that can support knowledge transfer. In particular, they focused on funding schemes and support projects. Data collection was followed up by questionnaires distributed in all seven countries with the aim of identifying possible expectations and perceived hurdles in the knowledge-transfer process for researchers and SMEs.

This research was critical in creating the 'Little yellow handbook' which contains practical tips, checklists and templates aimed at supporting researchers interested in pursuing academia-industry knowledge transfer. The book goes hand in hand with the 'K2I profile builder', developed to assist researchers with the presentation of their knowledge and with producing knowledge profiles.

Together, these tools help researchers better understand the needs and



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interests of industry and familiarises them with the language used by industry.

In their efforts to better identify innovation and promote knowledge exploitation, Knowledge2Innovation has created ties with major technology transfer networks such as Enterprise Europe Network. In return, the networks have access to the tool kits and knowledge created by Knowledge2Innovation.

The project was coordinated by the Food Industrial Research and Technological Development Company SA in Greece.

Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE). <http://cordis.europa.eu/marketplace>search>offers>6718>

## CO<sub>2</sub> sensors that do not mind getting wet

*Europe is poised to capture an important market for continuous carbon dioxide sensors for seawater applications. The new instrument will also help safeguard the productivity of its highly valued aquaculture industry.*

Half of the fish on our plate comes from fish farms. Europe is an important player in this highly competitive industry. The greenhouse gas emissions associated with climate change present a possible risk to the future of aquaculture. However, it is not known how fish will respond to rising concentrations of dissolved carbon dioxide (CO<sub>2</sub>) in our oceans and lakes.

The aim of the Optoco2fish<sup>1</sup> project was to investigate the potential impact of increased CO<sub>2</sub> concentrations on fish health. EU funding was also put towards developing a sensor capable of accurately detecting CO<sub>2</sub> dissolved in seawater.

The various species of fish common to aquaculture were exposed to elevated levels of CO<sub>2</sub>, a condition known as hypercapnia. While brief exposure had limited effects, extended periods of exposure severely impaired the fish, often with fatal results.

As a consequence of this vulnerability, a measurement campaign was initiated. The goal was to determine how dissolved CO<sub>2</sub> concentrations vary between different aquaculture models, such as cages, ponds and flow-through systems, and fish species. High risk combinations have been identified.



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With respect to delivering an online CO<sub>2</sub> sensor capable of surviving in saltwater, the Optoco2fish team focused its efforts on sensitive membranes. Experiments have been conducted with different combinations of dyes, polymer matrixes and protective coatings. The most promising candidates have been selected for field tests.

Manufacturing and calibration issues must also be resolved in order for the sensor to be a viable solution for fish farmers looking to continuously monitor CO<sub>2</sub>. Oceanographers will also be

interested in such a sensor for studying the effects of climate change on the Earth's oceans.

The project was coordinated by Neotek in France.

1 'Development of an opto-chemical carbon dioxide sensor for aquaculture and oceanography applications'.

Funded under the FP7 specific programme Capacities under the theme 'Research for the benefit of SMEs'. <http://cordis.europa.eu/marketplace>search>offers>6715>

## Watching the drivers: a new perspective for safer roads

*By observing drivers and accidents in real-life situations using naturalistic observation, policy-makers may develop new ways to pre-empt collisions and create safer roads.*

A novel way of studying road fatalities and introducing safety measures is being developed using a research method known as naturalistic observation. This involves unobtrusively observing drivers in their natural settings to see how they react in normal situations while driving, as well as in collisions.

The EU-funded Prologue<sup>1</sup> project investigated how naturalistic observation can help implement more

effective safety measures. It considered the feasibility of a large-scale European study on the subject.

The project documented past initiatives in this direction, mostly small-scale studies on road safety, in addition to examining the relationship between distractions and collisions, among other issues.

Field trials and comparisons in this direction were conducted in Austria,

Greece, Israel, the Netherlands and Spain to examine various aspects: driver training, driver behaviour at intersections, in-vehicle distractions, and driver-assistance systems, among others.

One large-scale study in the United States has shown how naturalistic observation can shed light on driver behaviour and safety measures, an area that Prologue probed intensively. The project learned from the American experience and know-how in the field and attended workshops in the country. From these initiatives and existing resources, such as the 'European field operational test support action' (FESTA) Handbook, Prologue is developing a new methodology for naturalistic observation and road safety measures.

In addition, Prologue is working on familiarising potential stakeholders with the naturalistic observation method and explaining its advantages, incorporating their feedback and opinions in the matter through a user forum. Over

100 members strong, the forum is active in preparing newsletters, organising workshops and creating a platform for exchange on the subject.

The overall advantages of observing drivers in real-life situations will culminate in a novel way to consider road safety and develop effective measures. This is set to save lives, alleviate physical and mental trauma, and save authorities considerable costs.

The project was coordinated by the Stichting Wetenschappelijk Onderzoek Verkeersveiligheid in the Netherlands.

1 'Promoting real life observations for gaining understanding of road behaviour in Europe'.

Funded under the FP7 specific programme Cooperation under the theme 'Transport (including aeronautics)'.  
<http://cordis.europa.eu/marketplace>search>offers>6707>



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## Urban planning for sustainable city regions

*Suburban neighbourhoods are growing at a worrying rate, especially in post-communist Europe. Novel modelling technology can extrapolate growth and recommend effective policies to contain urban sprawl.*

Since the fall of communism, central and eastern Europe have seen suburban sprawl disfigure the countryside and introduce several challenges associated with metropolitan expansion. This growth is taking place without thought for true urban planning and sustainable development.

The EU-funded MUGPCEE<sup>1</sup> project examined policy-making in urban growth for the region. It exploited cutting-edge research and technology in urban-growth modelling for post-socialist cities and explored different future scenarios.

In collaboration with the Centre for Advanced Spatial Analysis at University College London in

the United Kingdom, MUGPCEE identified policies that manage urban expansion in metropolitan areas, incorporating sustainable development into the equation. In addition, the project reviewed all available publications on the subject and identified the most appropriate modelling system (namely Metronamica) to map suburban expansion.

To achieve its aims, the project used the area of West London as a case study, modelling its urban growth in 20-year increments throughout the last century. This model was then used to map expansion in Prague, the Czech Republic, since the fall of the Iron Curtain.



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The MUGPCEE results have helped the team to analyse urban development in light of market-based principles and economies, with a strong focus on suburban expansion. The project's illuminating findings have appeared in several journals and books, as well as numerous seminars and conferences from Hamburg, Germany to Tokyo, Japan. The methods and databases developed during this project will be valuable in undertaking similar studies related to urban and suburban expansion.

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

1 'Modeling urban growth patterns in central and eastern Europe with agent based systems and cellular automata'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace>search>offers>6703>

## ENVIRONMENT AND SOCIETY

### Digging deep for soil microbes

*One way to increase the yield of a potato crop is to apply artificial fertilisers. A European project is exploring a more sustainable way, using soil microbes.*



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The origin of the potato lies in the central Andean highlands in South America, where farmers grow more

than 3800 native varieties. These varieties have evolved to survive in harsh conditions with minimal

input of nutrients and without chemical control for disease.

The Valoram<sup>1</sup> project is hoping to further improve the sustainability and yield of Andean potatoes. The project is taking an in-depth look at Andean soil microbial diversity with the aim of selecting the very fittest of microbes to inoculate the soil.

Since the start of the project in 2009, well over 1300 bacteria have been selected for study. A method to preserve these microbes using cryogenics has been perfected. The bacteria are trapped on alginate beads and preserved perfectly using the naturally occurring sugar trehalose that prevents rupture of the cell contents during freezing.

In addition, over 1000 bacteria have been put through genomic analysis of the raw environmental isolates, a relatively new field known as

metagenomics. The outcome is an initial selection of microorganisms that can promote plant growth and reduce disease.

Farmers associations are cooperating closely with Valoram partners and are of course involved in field trials. Identification of beneficial strains will encourage the use of organic farming methods in the Andes as well as in Europe.

The project was coordinated by the Université Catholique de Louvain in Belgium.

- 1 'Valorizing Andean microbial diversity through sustainable intensification of potato-based farming systems'.

Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE).  
<http://cordis.europa.eu/marketplace/search/offers/6697>

### Global change and rocky shore species

*Human activities can have a serious impact on the marine environment, with many Mediterranean species now facing possible extinction. Scientists working on an EU-funded project have been investigating how global changes will affect the biology of coastal waters.*

Europe's marine biodiversity represents a huge but fragile resource that is of major economic and cultural importance to local communities. Coastal areas are particularly vulnerable because they are among the most biodiverse and productive ecosystems in the world. The MAREA<sup>1</sup> project was established to develop a greater understanding of the threat to the Mediterranean Sea's rocky north-west coastline. This area contains long-lived, sessile species, which are particularly sensitive to climate change.

Project partners analysed the long-term effect on marine ecosystems in order to determine global patterns behind ecosystem collapse. This was achieved

by focusing on the reactions of both communities of organisms and individual species to major disturbance, such as climate change. Researchers conducted field surveys to obtain important data regarding temperature and population dynamics.

Scientists used a combination of photographic images, statistics, geographical information systems and molecular markers to determine the effect of human activities on the marine environment.

The scientific knowledge and data gained through the initiative will help researchers to predict changes resulting from global warming, and decision-makers to contribute to improved strategies



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for biological conservation. Marine ecosystem decline may be better analysed and managed through greater understanding of habitat loss and species loss, thanks to MAREA.

The project was coordinated by the Consejo Superior de Investigaciones Científicas in Spain.

- 1 'Structure and dynamics of marine rocky benthic communities: reactions and perspectives facing the global change'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace/search/offers/6742>

## Hats off to enzyme probes

*After a gene has been transcribed into a protein, many chemical events can occur that affect the structure and function of the molecule. As addition of small groups to the original molecule has a key regulatory role, the enzymes responsible are an excellent source of new drugs.*



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The study of exactly what a gene does in terms of production of proteins (gene transcription) is providing numerous molecules for which the function is unknown. Among these are many enzymes that control the addition of small groups of atoms to newly transcribed proteins.

The EU-funded Dekker40<sup>1</sup> project studied the phenomenon of post-translational modification using small molecule inhibitors. These prevent modification from taking place, allowing the exact role of the enzyme in question to then be determined.

One group of molecules of interest to the team in particular are 'Histone acetyltransferases' (HATs). These are a recently discovered group of enzymes for which there were no selective inhibitors to identify their function.

Two HAT enzymes were studied and the Dekker40 researchers identified several inhibitors for both molecules. This development will prove beneficial for so-called activity-based profiling where inhibitors are used as

probes in different tissues to pinpoint active enzymes.

Inhibitors were also identified with improved potency in cell-based studies of histone acetylation. Inhibitors for HATs based on the natural product anacardic acid found in cashew nuts and mangoes produced a set of inhibitors with improved strength and selectivity.

Inflammatory lung diseases, such as asthma, are often characterised by an increase in HAT activity. Inhibitors based on anacardic acid are promising candidates for the treatment of inflammatory disease.

The project was coordinated by the Rijksuniversiteit Groningen in the Netherlands.

1 'Novel approaches towards understanding of gene transcription using small molecules as tools'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace>  
 search > offers > 6742

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## IT AND TELECOMMUNICATIONS



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# Broadband, a gig per second for all!

*Work by European scientists has prepared the ground to make ultra-high-speed broadband networks a reality for many more Europeans. Researchers developed technology that can cost-effectively deliver up to one gigabit per second (1 Gbps) both to your front door and within the home network.*

Up to now, 1 Gbps networks have been limited to countries like Sweden that enjoy very advanced telecoms infrastructure. But the research carried out by EU-funded scientists will make it easier for other countries to set up their own high-speed networks.

The extra speed is required for emerging data applications and it will deliver such services as super-high-definition TV, video on demand, next-generation gaming as well as remote medical diagnostics and elderly care.

'Services like local and global storage area networks, high-definition video-conferencing and grid computing will need high-speed networks,' explains Dr Mikhail Popov, coordinator of the ALPHA<sup>1</sup> project.

'Some applications, like online interactive medical diagnostic, do not tolerate data compression, so you need raw speed to make these services work properly. Ultimately, it might require more than 1 Gbps for each user with a very high quality of service,' he continues.

ALPHA was a highly ambitious 39-month project that tackled high-speed network bottlenecks in the access network — which delivers broadband to the front door — and in building networks for the home and office.

The scientists in the project sought to define new network models and standards to deliver blistering speeds at the lowest possible cost and with the most logical upgrade path. The work included test beds and validations to demonstrate that the ALPHA proposals can cope with massively rising bandwidth requirements.

'Beyond the high bandwidth requirements, the solution should also provide foundations for easy deployment and maintenance, affordable scalability as well as for easy quality-of-service provisioning in the network,' notes Dr Popov.

ALPHA was a major undertaking, with 17 partners and a total budget over EUR 16 million (around two-thirds coming from the European Commission). It addressed both future access and in-building networks for the home and office, and researched special infrastructure to support a heterogeneous environment of converged wired and wireless technologies.

### Huge field

This is a huge field. There are dozens of technologies and enabling systems all along the broadband pipe, from core and metro area networks to in-home outlets. Each enabling technology has several potentially contending technical solutions, each with their advantages and disadvantages. And those solutions are all evolving rapidly.

Take 'Active optical networks' and 'Passive optical networks' (AON and PON), for example, which are the physical heart of ALPHA's work. AONs use electrically powered switching to manage signal distribution, while PONs use optical splitters.

PONs are efficient and reliable due to a simple passive-only fibre infrastructure in the field, but they have a lower range than AONs and it can be difficult to isolate the location of a failure in a PONs network. Data transmissions can also slow down during peak load, because bandwidth is not dedicated to individual subscribers, but split among a number of them.

AONs rely on ethernet technology, which makes interoperability among vendors easier to achieve. Subscribers can select hardware that delivers an appropriate data transmission rate and scale up as needed without having to restructure the network. But AON deployment can be more costly than PONs.

Then there is the optical fibre itself, with a choice between glass single-mode, glass multi-mode and plastic, each with its own advantages. There are routers, switches, multiplexers, amplifiers and dozens of elements that handle bandwidth from the backbone to end-user.

And there are distinct networks all with their own constraints and demands. The telecoms

## IT AND TELECOMMUNICATIONS

backbone connects to the 'Metro area network' (MAN), which in turn splits into 'Local access networks' (LANs) that connect to the home or office. Then LANs connect individual devices within buildings.

What is more, all the work has to meet European and international standards and norms. And there are several standards bodies for broadband to consider, including the IEEE and the International Telecommunications Union (ITU).

Despite these challenges, ALPHA achieved its objectives, defining, integrating and validating the wide range of technologies required to make ultra-high-speed broadband for access networks and home domains a reality. Indeed, it is impossible to go into all the work undertaken by the project in this article.

### Perplexing multiplexing

But one very good example is the team's work with multiplexing, the technique used to broadcast several streams of data over a single line. Multiplexing will be a key factor in any future network because it uses physical wires in the most efficient way.

'Wavelength division multiplexing' (WDM) works by using light at different wavelengths, or colours, to create separate streams and so enlarge the capacity of a line. WDM is considered the technology of the future, but it is too expensive at current prices.

'Time division multiplexing' (TDM) is more affordable, since it is performed by electronics. It splits data streams over time, with each stream broadcast in a particular time slot. So, the ALPHA team developed a hybrid WDM/TDM multiplexing system, delivering 10 Gbps over a passive optical network. This ALPHA technology supports access networks, which supply broadband connections to the home or office. The ALPHA solution even supports radio-over-fibre, a technology for handling the support of mobile broadband in wired networks.

The multiplexer system is a key crossover technology that will let networks evolve cost-effectively. It both enhances what is available now and paves the way for next-generation broadband. But that is only one small part of ALPHA's work.

The team achieved a world first by recording speeds of 20 Gbps in real time with a novel modem that used optical 'Orthogonal frequency division multiplexing' (OOFMD), which creates multiple streams of data by modulating tone. It is a useful and popular transmission method because it can handle difficult channel conditions, like fading and interference.

The consortium worked on 'Universal plug-and-play quality of service' (UPnP QoS) and 'Generalised multi-protocol label switching' (GMPLS), which add service guarantees to both the home and access networks.

The project also developed a low-cost gigabit modem for home networks that works with plastic optical fibres, a crucial bit of technology that would let users download a DVD quality movie in just 60 seconds.

Right now those speeds are only available in a few places around the world, but thanks to the architecture and transmission solutions developed by ALPHA it will be a lot easier for other networks to upgrade.

In all, the project has had a remarkable impact, with its work leading to 9 patent applications, 77 journal peer-reviewed journal publications and over 200 conference contributions. The team also contributed significantly to standardisation efforts.

The ALPHA project was coordinated by Acreo AB in Sweden.

1 'Architectures for flexible photonic home and access'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communications technologies' (ICT).  
<http://cordis.europa.eu/marketplace> > search > offers > 6769



## Setting strong network foundations

*Efforts to bring together multinational teams, varying degrees of expertise and research objectives call for solid networking and a common base for communication.*



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The EU-funded Eurosis project aimed to facilitate the transnational exchange of experiences and sharing of best practices in efforts to strengthen the 'Science in society' (SiS) concept and its participating National Contact Points (NCPs). The approach focused on creating the infrastructure needed for the SiS NCP network to begin teamwork with common goals and benefits while providing stakeholders with effective services. To achieve such

a functional framework, project partners provided training activities, information workshops and databases. Alongside these objectives, another goal was to develop a well-structured partner search tool.

In order to realise a knowledge-management tool, one of the project's first activities was to survey already nominated NCPs by mapping their competences and the needs of stakeholders. After

accomplishing this, sights were set on updating the tool with content of NCP interest. This also aimed to set a base for future collaboration with the NCP community. Training events and other hosted gatherings were successful in creating strong bonds and promoting networking among the NCPs. A critical factor in achieving this was cooperation and knowledge exchange in line with Eurosis project objectives.

SiS NCPs' needs were mapped and identified using questionnaires and survey results, which showed the biggest skill gap to be in financial/project management. Training events were realised in various countries with trainees, trainers and topics being chosen according to results of the needs analysis. Major progress was achieved in work on the partner search tool by employing web mapping. However, project partners decided to change

their focus in this area, agreeing to support and aim at improving the Community Research and Development Information Service (CORDIS) search tool rather than developing a new one.

Efforts to promote and share project information resulted in an inclusive Dissemination and Exploitation Plan, following which materials were prepared and printed. These included leaflets, posters and e-newsletters, as well as a project website.

The project was coordinated by the Euroscience Greek Regional Section in Greece.

Funded under the FP7 specific programme Capacities under the theme 'Science in society'.  
<http://cordis.europa.eu/marketplace> > search > offers > 6852

## IT AND TELECOMMUNICATIONS



### Full-proof theorems

*A new European research initiative is creating software that will help prove the validity of theorems in a quick, efficient and accurate way.*

'Automated theorem proving' (ATP), also known as automated deduction, is a key subfield of automated reasoning. It is concerned with proving formally represented theorems in a wide range of domains, through the use of computers. Since 1993, development of effective automated theorem proving systems has been supported by the 'Thousands of problems for theorem provers' (TPTP) problem library and the 'Thousands of solutions from theorem provers' (TSTP) solution library.

The EU-funded project THFTPTP<sup>1</sup> was focused on research and development of automated theorem proving in classical higher-order logic. It designed a novel

TPTP language to express problems and solutions in higher-order logic. The software involves a collection of higher-order test problems in TPTP and higher-order problem solutions in TSTP, as well as a result and output ontology for higher-order ATP. The project also provided tools for preparing, processing and analysing higher-order ATP problems and solutions.

The results of the project were disseminated through several papers at conferences and workshops, as well as through conferences themselves and presentations. Three grant proposals were strongly influenced by the project, ascertaining the viability of its arguments and results. The new THFTPTP infrastructure has been integrated with



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the TPTP project (available at <http://www.tptp.org>).

The THFTPTP project opened up several new research directions and initiatives that will facilitate the development of new principles. It has offered valuable transfer of knowledge and expertise to researchers and students at the project's host university and 11 other institutions across Europe.

In short, THFTPTP successfully developed the software products it set out to create and helped develop five fully automated ATP

systems for higher-order logic in the THF format.

The project was coordinated by the Free University Berlin in Germany.

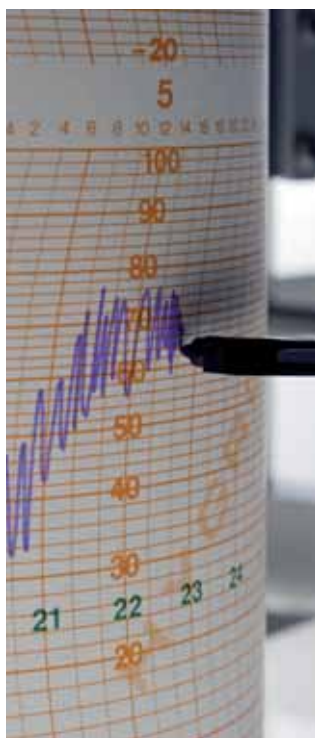
1 'An Infrastructure for typed higher-order form automated theorem proving'.

**For further information:**  
<http://christoph-benzmueller.de/>  
 Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace/search> > offers > 6814



### Mediterranean earthquake intelligence

*By joining forces, North African and European countries around the Mediterranean can develop better surveillance of seismic activities and establish tsunami-warning technology.*



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North Africa and southern Europe represent a region around the Mediterranean that is often prone to earthquakes. At the same time, many of these countries do not have the knowledge or technology required to monitor and measure earthquakes, or to assess the risks involved.

The EU-funded Eerwem<sup>1</sup> project established an important platform for exchange among seismological communities in Europe and North Africa.

This project ensures enhanced exchange of results and ongoing monitoring of the tectonic system of the Eurasia-Africa collision. A project workshop in Spain brought researchers from key European earthquake research centres and observatories, combining European rapid data exchange with newly

created infrastructure at the Western Mediterranean seismological institutes. Participants discussed seismic risks and activity in the region, enjoying representation from several Mediterranean countries including Algeria, Libya, Monaco, Morocco and Tunisia.

The project also fostered links with the 'Global earth observation system of systems' (GEOSS), 'Global monitoring of environment and security' (GMESS) and 'North-East Atlantic and Mediterranean tsunami-warning system' (NEAMTWS). It then produced a 'memorandum of understanding' (MoU) on improving global cooperation and building a regional network for earthquake surveillance, as well as facilitating access to advanced technologies. The MoU was signed by 18 institutes from 10 countries, leading to enhanced cooperation, multiple technical visits among seismological observatories and a dearth of papers on the subject.

The project was deemed highly successful in achieving its aims, resulting in the surveillance infrastructure being upgraded in many countries. Importantly, regional players in Algeria, Morocco and Tunisia laid the groundwork for establishing a tsunami-warning system for the western Mediterranean. Finally, a long-term seismological strategy for the region has started to take shape.

The project was coordinated by the European Mediterranean Seismological Centre, based in France.

1 'Earthquake monitoring and earthquake risk in western Mediterranean'.

**Funded under the FP6 programme 'International cooperation'.**  
<http://cordis.europa.eu/marketplace/search> > offers > 6847

## Better resource management for meta-genomic information processing

*Bio-informatics uses computer applications and statistical concepts to make sense of data retrieved from studies in biological processes at the molecular level. To do this, researchers rely on databases to solve problems related to managing and analysing this information.*



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Problems presenting in the field of bio-informatics and computational biology are often related to intricate, time-consuming and 'loaded' computational processes. Researchers believe many of these operational difficulties can be resolved by using a computational grid, a network of computers in various locations.

The bio-informatics field of meta-genomics involves the study of genomes of a community of microbes. Problems presenting here have to do with annotation (identifying the key features)

of these genomes as well as their assembly in various environments. Annotation gives biological meaning to raw datasets of information.

The Metagenogrids<sup>1</sup> project aimed to discover algorithmic solutions to these meta-genomics problems, to be resolved on grid computing platforms. However, researchers decided to refocus the study when efforts failed to form a solid collaboration for study on meta-genomics assembly. The new purpose was to come up with more efficient batch

scheduling so as to improve the allocation and management of resources across computational clusters. An added challenge was that of ensuring the quality of service for users of these platforms.

The EU-funded Metagenogrids team first tackled the issue of allocating resources for applications with unabated resource consumption rates and either never-ending execution times or unknown execution times. Several job-scheduling algorithms were developed, and results for high-performance computing (HPC) workloads were presented. In comparison to standard batch scheduling algorithms, results favoured using the newly proposed algorithms for vastly improved performance in the majority of experimental scenarios. This represented a step forward for the potential of combining virtualisation technology with lightweight scheduling strategies.

The project's results have advanced efforts with a view to the future design of resource-management systems for enhanced use of platforms, improved outcomes and quality of service. The foundations laid in this study appear strong enough to support further study that aims to extend results to applications whose resource consumption rates change during an application's execution.

The project was coordinated by the Institut national de recherche en informatique et en automatique (INRIA) in France.

1 'Algorithmics for metagenomics on grids'.

### For further information:

<http://www.NATEX.eu>  
Funded under the FP7  
specific programme People  
(Marie-Curie actions).  
<http://cordis.europa.eu/marketplace>  
search > offers > 6750

## Unravelling the mysteries of cosmic rays

*Advances in instrumentation, new theories and improved techniques are helping scientists finally understand the mysteries behind cosmic rays in the galaxy.*

About a century ago, Austrian physicist Victor Hess discovered cosmic rays. Today, the origin of these rays is still unclear. Gamma radiation is one way of studying cosmic rays, but has not proven to be very reliable.

The EU-funded project DiffuseGammaEmission<sup>1</sup> studied gamma rays from each direction of the Galaxy. It compared their properties with data on the 'interstellar medium' (ISM), i.e. the matter between star systems. The results were then used to examine cosmic ray flux in certain parts of the galaxy

where traditional methods of examination had not been fruitful.

The project's main objective was to study sources and distribution of cosmic rays by comparing new, detailed gamma ray maps. Team members considered regions of high gas density or 'molecular clouds' (MCs) and 'supernova remnants' (SNRs), recording the multi wavelength spectrum from radio to gamma rays emerging from MCs. It found that some unidentified energy sources may in fact be associated with clouds illuminated by cosmic rays coming from a nearby source.



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Exploiting gas data from the surveys of molecular and atomic hydrogen in the galaxy, the project team examined spectral and spatial distributions of the emissions. Different predictions and results from the project are promising to revolutionise the way scientists understand cosmic rays and reveal a better picture of their idiosyncrasies and sources. Finally, a better picture of cosmic rays will emerge.

The project was coordinated by the Max Planck Gesellschaft zur Förderung der Wissenschaften eV in Germany.

1 'Sources of cosmic rays and gamma ray emission from the Galaxy'

Funded under the FP7  
specific programme People  
(Marie-Curie actions).  
<http://cordis.europa.eu/marketplace>  
search > offers > 6795

## IT AND TELECOMMUNICATIONS

# Spinning can make wireless tech leaner too!

*Applied 'spintronics' has the potential to help solve problems of miniaturisation in the wireless sector. This emerging field of 'magneto-electronics' exploits an electron's intrinsic spin and the force exerted on electric currents in devices.*

Novel nano-electronic applications, such as those afforded by applied spintronics, seek to offer solutions for lighter, faster, smaller and better performing components and systems. Spintronics, technology focused on spin transport electronics, can ultimately deliver wireless components bringing together all common radio standards at minimum levels of power consumption.

Wireless devices make use of a classic inductor-capacitor system. This means the size and shape of the inductor invariably define the characteristics of the oscillator, a circuit producing a repetitive electronic signal. As such, this presents an obstacle to efforts to miniaturise to scale with accompanying microelectronic devices, such as a transistor.

The Spinapps<sup>1</sup> project is working on core technology geared at the

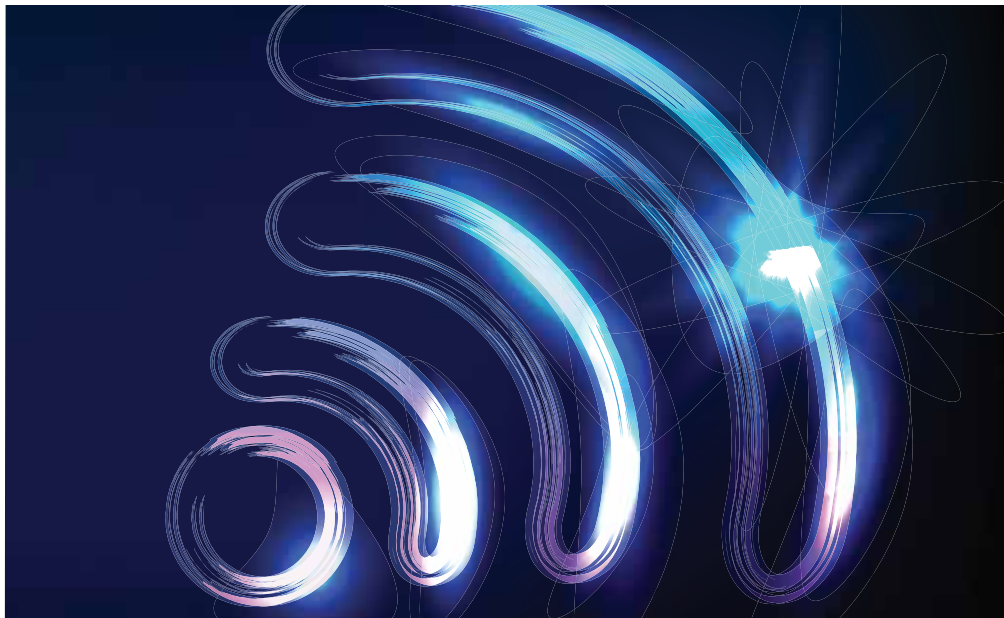
creation of a 'Spin torque oscillator' (STO). By adapting novel technology used in a magneto-resistive memory access application, research team members are confident they can produce a sub-micron radio frequency oscillator with desirable characteristics but without classical limitations.

Achieving this poses challenges: output power remains below the necessary level, and frequency stability and control still have to be addressed. Aiming to build on scientific and technical knowledge and market-driven needs, the EU-funded project intends to demonstrate a viable STO technology for specific market segments.

Activities have already succeeded in delivering a STO model, while work continues on magnetic simulations, noise properties of platforms and a simulation package. Having realised a simulation environment for STO circuits, project partners are now able to study how they are affected by known semiconductor noise and temperature dependence. This further enables efforts to develop circuit solutions for testing enhanced STO performance.

With work continuing on STO output limitations, benefits and design of optimal structures, goals remain focused on delivering STO operation. Beyond the commercial benefits of achieving these goals, project results also stand to contribute to the safety and security of European citizens in the form of radar and alert-based applications.

The project was coordinated by the Kungliga Tekniska Högskolan in Sweden.



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1 'Spin torque oscillators for wireless and radar applications'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 6798

## Digital travel companion

*New technology may allow travellers to locate and obtain goods and services in their area, warn them of any changes or obstacles on their trip, and provide travel tips.*

The market place is in need of new technologies that are both mobile and online. Service suppliers and content suppliers came together under one platform to integrate the needs and systems of both suppliers and buyers.

Imagine a hand-held device that guides you when you are on the

road, connects you to customers, allows you to reschedule a trip and provides information about the area you are in. Thanks to the EU-funded iTravel<sup>1</sup> project, steps have been made towards realising the concept.

The iTravel project produced key recommendations to build a

platform on mobile devices that would be very powerful in providing and exchanging valuable information. iTravel provides 'the connected traveller' with sophisticated content about the community and quick access to buy almost anything, including delivery of goods and services.

If the concept becomes a reality, it could be the first 'Business-to-business' (B2B) 'eMarketplace' in the travel and traffic information services sector.

The concept also includes 'a virtual travel assistant' that supports travellers before and during a journey, offering tailor-made, context-based information at any location.

Most available online services for travellers are poorly integrated and do not offer the level of personalisation conceived under this new platform. They are also not readily available to travellers during the journey itself, which would be very useful, such as informing

the traveller of any disruptions and proposing alternatives.

The project team recommended that a number of live pilot studies in selected European cities should be undertaken to test the new prototype and see how it functions. If the expected results come about thanks to the successes of the project, this may change the way we travel forever.

The project was coordinated by the European Road transport Telematics Implementation Coordination Organisation, based in Belgium.

The project was coordinated by the European Mediterranean Seismological Centre, based in France.

1 'i-Travel - service platform for the connected traveller'.

Funded under the FP7 specific programme Cooperation under the theme Transport. <http://cordis.europa.eu/marketplace> > search > offers > 6800



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## Rethinking gas detection

*New cost-effective and highly accurate gas detection technology will mean safer, cleaner environments. This applies to industry, public spaces or, eventually, private spaces as well.*

Different types of gas can be very beneficial to energy and industry, but can also be harmful to health if they are not processed, distributed and exploited correctly. Safety protocols in public places, be they hospitals or factories, rely on gas-detection systems that today still have their limitations.

The EU-funded S3<sup>1</sup> project is working to improve gas detection. It is developing breakthrough technologies in gas sensing that are more sensitive yet cost efficient.

The project is a partnership between EU and Russian stakeholders. It involves developing innovative sensing layers based on metal oxide nano-wires and surfaces that can

detect nano-materials and target molecules much more quickly.

These compact low-power, low-cost detectors can be used to monitor gas levels and toxins in many fields including aeronautics, national security, energy production plants and chemical industries.

The project team has so far identified all the requirements and specifications of prototype sensors, in addition to studying the feasibility of the concept. Work has been undertaken on filtering technology, sensitive layers, metal oxide nano-wires and vapour deposition processes. Molecular engineering of surfaces, polymer structures, ceramic substrates and



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hydrocarbon substitutes are all playing a role in the development of the new technology.

The concept is undergoing rigorous testing to ensure efficiency and viability in the market, considering as well extremely miniature versions of the new detectors. The S3 technology has already attracted attention with results being published in major scientific journals. Once it gets off the ground, industry and the public at large may end up breathing more easily.

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

1 'Surface ionization in nano-MOX gas sensors with increased selectivity, sensitivity and stability for detection of low concentrations of toxic and explosive agents'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanosciences, nanotechnologies, materials & new production technologies'. <http://cordis.europa.eu/marketplace> > search > offers > 6820

## IT AND TELECOMMUNICATIONS

# Putting computer models to work for policy-makers

*By knitting together a tapestry of agricultural models covering a broad range of scales, researchers involved in the Seamless<sup>1</sup> project have created a powerful tool for policy analysis.*

While most can agree that developing a model for sustainable agriculture is desirable, not all can agree on how it can be achieved.

A number of policies have been adopted at the European as well as Member State level. Analysing the impact of these policies is

essential for improving their effectiveness over time.

The Seamless project aimed to deliver the tools necessary to perform such analyses. Considerable EU funding was used to bring together agricultural modelling experts from across the continent to develop an integrated framework.

Models covering a wide range of scales, from a single farm all the way up to the global agro-economy, were pooled together. The resulting system empowers its users with the ability to examine potential scenarios applying various kinds of policies and legislative instruments. Economic, environmental and social indicators are then used to evaluate the overall impact.

The key to the integrated framework is that it can provide some

insight prior to actual implementation of the planned measures. It is this aspect, the Seamless consortium believes, that will make it invaluable to policy-makers at the national as well as European level.

The project was coordinated by Wageningen Universiteit in the Netherlands.



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1 'An Infrastructure for Typed Higher-order Form Automated Theorem Proving'.

### For further information:

<http://www.enr.wur.nl/UK/Research/>  
Funded under the FP6 programme 'Sustainable development'.  
<http://cordis.europa.eu/marketplace/search/offers/6737>

## The power of carbs

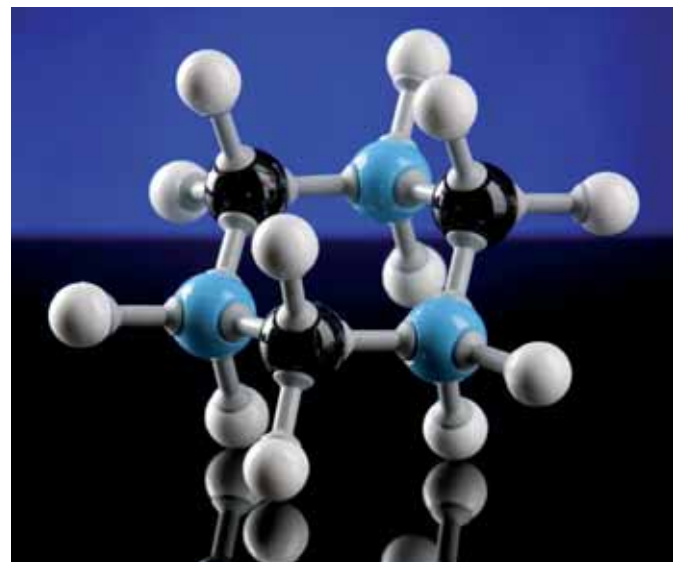
*A sophisticated database of information on carbohydrates is in the making. The end result will speed up the study of related ailments and advance fields such as glycol biology very rapidly.*

Understanding carbohydrates is not only important for weight control. It also sheds light on many viral, bacterial and inflammatory diseases. Building a global database for carbohydrates and involved processes can help researchers collaborate in teasing out their secrets.

The EU-sponsored project EUROCarbDB<sup>1</sup> has taken steps to build such a database. Its aim is to advance the study of glycol biology by linking the database to bio-informatics systems and other high-tech tools. In more specific terms, the database will allow researchers to compare information on the genomics, proteomics, large-scale acid sequencing and glycomics related to carbohydrates.

The database allows researchers to input both their raw data and interpreted results into one resource, resulting in a powerful online tool based on search algorithms and analysis. This facilitates processing and interpretation of results to a very high degree.

In the same way that technology has accelerated the study of genomics through more efficient nucleic acid sequencing, EUROCarbDB is creating a similar system for glycomics. The project already developed the required architecture for the database during its mandate, and development is continuing beyond the actual project. Other components will be linked to the database, such as 3D structures derived from X-ray studies, multidimensional



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'Nuclear magnetic resonance' (NMR) spectra and studies regarding glyco-probes.

The final database will represent a powerful open access tool providing free information and software for researchers to input their data and extract valuable information in this area.

The project was coordinated by the Deutsches Krebsforschungszentrum in Germany.

1 'Design studies related to the development of distributed, web-based european carbohydrate data bases'.

Funded under the FP6 specific programme 'Research infrastructures'.  
<http://cordis.europa.eu/marketplace/search/offers/6741>

## Strange planets

*Newly discovered bodies in the sky represent an exciting time for astronomers who must now identify and categorise them using the latest technology.*



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Deep space is full of mysteries that keep multiplying as the technology to observe them steadily improves. Astronomers have recently discovered some mysterious celestial bodies that have a very low mass yet display a strong photometric variability. These could be extrasolar bodies, 'brown dwarfs' as they are known

to scientists, or something completely new.

The EU-funded Brown Dwarf<sup>1</sup> project set out to discover what these bodies are exactly. It examined magnetospheric accretion, eclipses by planetary companions and associated spectroscopic variations in order to help identify

them. The project team worked on identifying the temperature, radius, mass and age of these bodies to confirm or refute their status as possible brown dwarfs.

Using the Kuiper telescope in Arizona, in the United States, the team studied the movement of these planetary bodies and their interaction with other celestial bodies, searching for new planets orbiting massive stars. Using a novel technique of observation, the project team focused also on dayside vs. nightside cooling to model the light curves and spectra of extrasolar planets.

In parallel, it conducted computer simulations and studied the synthetic light curves and spectra of brown dwarfs, as well as the synthetic light curves and transit radius spectra of the extrasolar planets. By comparing these

simulations with existing and future observations, new kinds of bodies may be identified.

Interesting observations have already emerged, and the results of this project are set to be very useful in studying spectra and light curves of extrasolar planets and brown dwarfs. They may even lead to understanding interior and chemical composition of these bodies, uncovering their true nature once and for all.

The project was coordinated by the Astronomical Institute of the Slovak Academy of Sciences in Slovakia.

1 'Brown dwarfs and extrasolar planets'.

**For further information:**  
<http://www.ta3.sk/~budaj/shellspec>  
 Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace/search/offers/6817>

## A helping hand for the land

*The Transkei area of South Africa was once an independent homeland for the Xhosa-speaking people. Now it has been fully reintegrated into the Republic of South Africa.*

Surrounded by mountains, rivers and the Indian Ocean, the Transkei has long been suffering from a faltering ecosystem, soil erosion and land degradation. Water catchment areas in the region have also been of concern to authorities and environmentalists.

The EU-funded EO-Landeg<sup>1</sup> project set out to address these issues. The project monitored conservation and proposed measures to combat these phenomena, focusing on technical assessments, economic productivity and poverty alleviation.

Through workshops and related activities, the project exploited local expertise, monitored ongoing research and facilitated accessibility to spatial data

(e.g. satellite maps) in order to advance its cause. This involved the work of South African and European research teams already active in the region to address issues such as natural-resource degradation, land use and self governance. By conducting advanced data gathering and collaborative efforts, a set of recommendations and a blueprint to remedy the situation were elaborated.

The project also worked on remote-sensing tools and monitors, which have allowed stakeholders to measure changes in the environment. It set up a working group to investigate remote sensing to monitor degradation, desertification, erosion, etc. Technologies employed included radar, radar interferometry, imaging



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spectroscopy and very high spatial resolution. A project workshop also emphasised how remediation and conservation measures can involve local communities.

The results of the project were successfully disseminated to local stakeholders and policy-makers, while EO-Landeg was tested as an educational tool for communities, schools and universities. It provided a site-based model as a research platform and information management system that could be compared to others or even applied to other regions of the world. The full impact of the project's research and

recommendations will undoubtedly be felt in the years to come.

The project was coordinated by the Bureau de recherches géologiques et minières in France.

1 'Earth observation initiative in former homeland of South Africa in support to EU activities on land degradation and integrated catchment management'.

**Funded under the FP6 programme 'International cooperation'.**  
<http://cordis.europa.eu/marketplace/search/offers/6843>

## INDUSTRIAL TECHNOLOGIES



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# Marrying innovation with old traditions for European bread

*It is safe to say that Europeans love their bread. Whether it is Germany's dark pumpernickel or France's baguette, Europeans enjoy consuming this starchy food. A team of researchers led by Kaunas University of Technology in Lithuania believes that more Europeans are now baking their own, or buying it from their local bakeries. The results are part of the FERMFOOD<sup>1</sup> project, which is supported under EUREKA, the European platform for research and development (R&D).*

Professor Grazina Juodeikiene of Kaunas University of Technology suggests that people are looking for the flavour and texture that most industrial bread makers omit from their products. According to Professor Juodeikiene, the results of the study may provide the means for bread to retain the taste consumers crave while safely remaining on the shelves for longer periods of time.

When a foreign company visited Lithuania to teach local bakers how to bake different types of bread, Professor Juodeikiene decided to investigate how bread can be made to be both delicious and long-lasting. 'It was excellent, but the next day you could play baseball with it,' she says. 'My idea was to develop bread with what I now call the big five: longer shelf life, better flavour, better texture, with more dietary fibre and fewer additives.'

The study obtained some interesting results including ways to meet the demands of today's consumers by drawing on an ancient bread-making technique. Lithuanians, along with Estonians and Latvians, eat sourdough bread, made using a natural leavening method that some experts believe dates back to the time of ancient Egypt.

Most of Europe has replaced this leavening technique by industrially processed yeast and food additives. Sourdough bread, however, continues to be a main staple in the Baltic and other parts of the globe. The key ingredient in sourdough is a 'starter' or 'mother' of flour and water that ferments when a *lactobacillus* culture is added. This starter is what gives lightness to the dough. Bakers feed and preserve this living culture in order to use it in successive loaves.

Lithuanian bakers depended on starters made abroad. So Professor Juodeikiene believed it was time for Lithuanians to develop their own starter dough. For the purposes of this study, the FERMFOOD team collected samples of the *lactobacillus* cultures from bakeries across Lithuania.

The researchers from Estonia, Latvia and Lithuania evaluated the various forms of cultures; they explored what factors impacted the sourdough bread and when it would go mouldy. The bread's texture was tested with sophisticated equipment. Thanks to acoustic waves, the team were able to repeat tests on the same slice of bread because it did not fall to pieces.

The team developed more effective cultures to generate better long-lasting bread, with some

loaves lasting three weeks and staying free of mould.

Government representatives from abroad have already expressed an interest in the results of the FERMFOOD project. The Japanese embassy at Vilnius has requested more information about the outcome of the bread-making technique.

'The next big challenge is how we feed a growing world population,' Professor Juodeikiene says. 'We have no option but to intensify crop production. What was so nice about FERMFOOD is how practical it was, and that I see such a future in this research.'

The project was coordinated by Kaunas University in Lithuania.

1 'Fermented products by using lactic acid bacteria with antimicrobial activity for bread production'.

## Plasma-cleaned eggs

*Our growing consumption of eggs and egg products raises the question of how to kill the dangerous bacteria found on the shells. A new machine developed as part of the EU-backed Eggsterilisation<sup>1</sup> project solves the question in a most spectacular manner.*



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'We're working on ways to sterilise eggs using plasma at atmospheric pressure level,' said Project Manager Yago Yáñez.

'We put the eggs in a closed reactor, which we fill with inert gases at atmospheric pressure. Then we use high voltage — around 30 kilovolts — to create plasma around the eggs.'

Without cooking the eggs, this rapid treatment kills virtually all the bacteria on the shells.

'The plasma works in several ways: most importantly, it creates UV emission, a widely used sterilisation procedure. It also produces ionised particles that kill bacteria too,' added Mr Yáñez.

It is hoped this European-funded project will help solve the problem of food bacteria.

Every year, salmonella alone affects thousands of people across Europe.

There are other sterilisation methods, such as chloride baths or radiation exposure but it seems plasma is the safest.

'In Europe, chemical baths are not allowed because of the risk of contamination of the egg itself, and gamma rays are not very popular among consumers. So the egg-producing industry keeps demanding new solutions to sterilise egg shells,' said Jacobo Álvarez of CRIC, a Barcelona-based private research and engineering centre.

This new prototype developed by European researchers kills 99.5% of the bacteria found on egg shells.

Further improvements are expected before this new technology is implemented in the egg industry.

'The two main benefits of our sterilisation system are, firstly, safer eggs, less likely to spread disease, and secondly, a longer shelf-life — so they can be stored longer,' explained Mr Yáñez.

The project was coordinated by the Centre de Recerca i Innovació de Catalunya (CRIC) in Spain.

- 1 'Development of a low cost, fast and secure system for egg sterilisation using an atmospheric pressure plasma system'.

Funded under the FP7 specific programme Capacities under the theme 'Research for the benefit of SMEs'.  
Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 22573

## Strong as stone

*Breathing life into the stone and slab industry has come in the form of camera technology that will speed up processing and standardisation.*



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Quality is a key determinant in the stone-processing industry, and speeding up quality control can help the industry flourish. By reducing time to market, this will help mitigate the environmental impact as well.

The EU-funded Provips<sup>1</sup> project used spectral sensors and cameras to optimise and quicken quality control, standardisation and classification. In essence, this is aimed at helping the industry increase productivity, save time, eliminate human error and meet client expectations in delivering standardised products.

The project team bridged the gap between industry requirements

and technical parameters of the technology, such as camera and sensors required for the project. It outlined necessary classifications and attributes used in inspecting stone tiles and slabs through a new 'Customised stone surface quality classification procedure' (CSSQPro). This procedure was integrated into a software program acquired by the vision system that focuses on the characteristics required by the client, and can be configured for different cases and clients.

The project team developed the first version of the software and tested it with successfully. It addressed colour systems, pixel structure and other necessary refinements to produce a powerful system. A project website was also created to update both the members of the project consortium and the public at large regarding progress achieved. When

the system is perfected, quicker and more accurate delivery of stone products to consumers will be realised, giving a major boost to the stone sector and this facet of the economy. In the meantime, faster and more streamlined delivery will mean less of an impact on the environment, adding a green component to this new process.

The project was coordinated by CNI Informatica in Italy.

- 1 'Development of an automated classification system for polished stone slabs and tiles'.

For further information:  
<http://www.provips.net>  
Funded under the FP6 programme 'SME activities'.  
<http://cordis.europa.eu/marketplace> > search > offers > 6821

## INDUSTRIAL TECHNOLOGIES

### Filtering out the dirt

*Filters are used in numerous applications and traditionally require manual cleaning to run effectively. A new device and novel technology may automate filter cleaning, helping streamline industrial processes and water treatment significantly.*

A simple filtering device can make the difference between health and disease or between a good product and a bad product. Filters for water and wastewater are crucial to our health, but are also valuable in industrial processes like fuel, energy, food and the agro-industry.

Filters generally have membranes which collect filtered residues,

and these membranes can often get very dirty and clogged, causing complications and dangerously compromising the filtering process. A harmful 'cake layer' may form, causing a phenomenon called 'fouling'. The EU-funded project Hi-Fre<sup>1</sup> is developing an 'Efficient membrane filtration units with integrated high frequency back-pulsing device'. Put simply, this means that once the

filter starts clogging, the device reverses the thrust with a lot of power to safely flush out harmful residue.

Hi-Fre is developing such a device to be integrated into filtration systems and beyond. The applications being considered for this back-pulsing technology range from the treatment of liquid residues from biomass-based production and reuse of process fluids and wastewater.

The project addresses all critical points along the filtering process. It delves into the hydrodynamics of high-frequency back-pulsing and novel back-pulsing devices, as well as adapted membrane configurations and new applications for this creative technique. The technique works by reversing the pressure between the feed and the outer side of the filter using short back-pulses in a very controlled process.

In the first phase of the project, seven 'Small and medium-sized enterprises' (SMEs) and one industrial end-user, in addition to R&D stakeholders have all investigated the system's design. They agreed that a successful back-pulse device should be capable of controlling back-pulse frequency and be flexible enough to work with different types of sophisticated membranes.

Fortunately, the back-pulse device developed meets these requirements and has been constructed in a practical way, using a motor-driven piston rather than valves.

Continued testing against different membrane modules provided by SME membrane manufacturers has also proven successful. The back-pulsing systems have been tested with different membranes and feed solutions such as surface water, biomass from wastewater treatment plants and liquid residues from biogas plants. With initial success confirmed, the way has been paved for further improvements of the systems and their application on a pilot scale.

The project was coordinated by A3 Water Solutions GmbH in Germany.



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1 'Efficient membrane filtration units with integrated high frequency backpulsing device'.

**For further information:**  
<http://www.hi-fre.eu>  
 Funded under the FP7 specific programme Capacities under the theme 'Research for the benefit of SMEs'.  
[http://cordis.europa.eu/marketplace > search > offers > 6714](http://cordis.europa.eu/marketplace/search)



### Improved nano-tubes for novel coating properties

*Extremely small nano-tubes at the cutting edge of science have the potential to create new coatings that can upgrade a variety of products, applications and equipment.*

Carbon nano-tubes are extremely small fabricated objects, each approximately 1/50000<sup>th</sup> of a human hair, that offer a myriad of applications for science and innovation. A new means of taking advantage of nano-tubes has

been developed by producing them in a more screw-like symmetrical way. This has allowed researchers to take advantage of their vibrational and electronic properties in novel ways, focusing on their near one-dimensionality.

The EU-funded Nanophensim<sup>1</sup> project is taking this research one step further. It is upgrading nano-tubes to build better nano-electronic devices. The project is investigating the optical properties of nano-tubes, or more specifically their electronic structure and optical transitions. This has a bearing on how nano-tubes can be layered on to a surface in an almost one-dimensional fashion.

Nanophensim is also studying any defects that surround nano-tubes, and examining how they are positioned in order to perfect their application. The dispersion of graphenes (atomic-level honeycomb 'wire' made of carbon) involved in the positioning of carbon nano-tubes is also being investigated. This dispersion and positioning is being examined in dozens of different types of

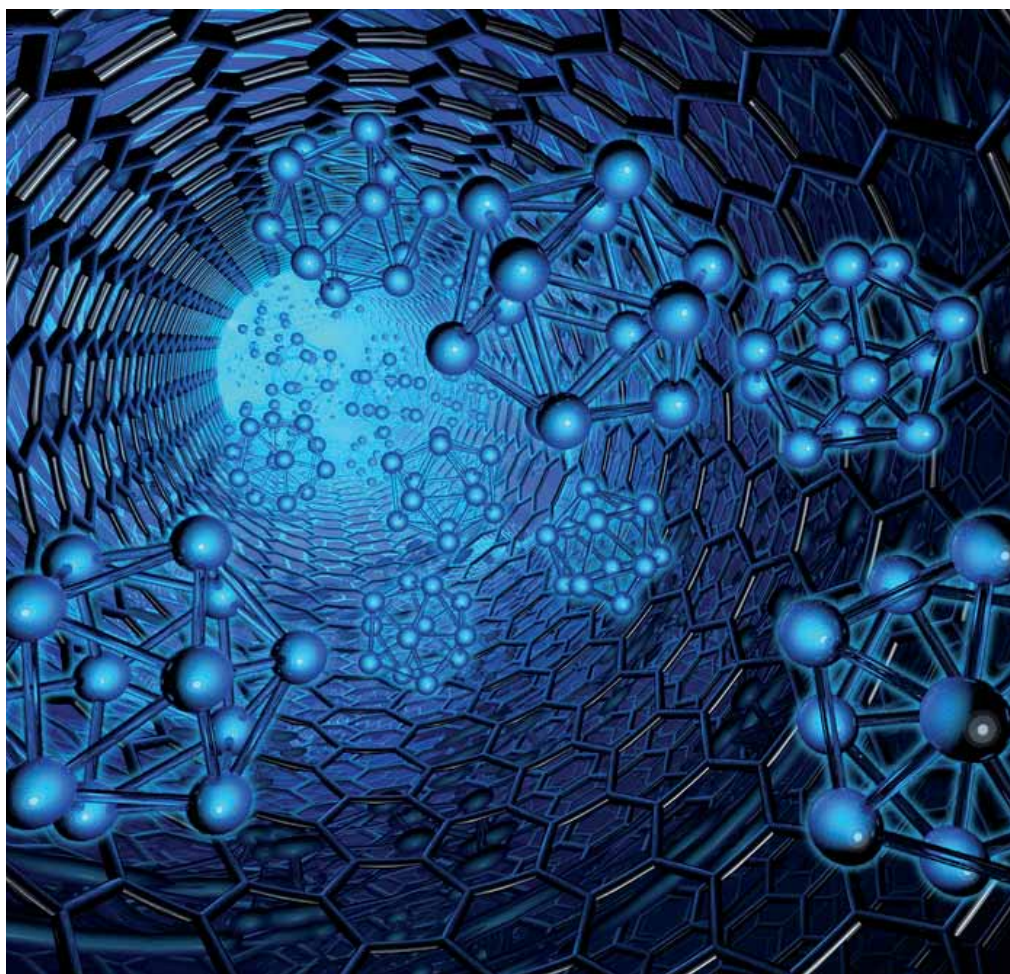
graphene and metallic nanotubes, yielding valuable data on perfecting the nano-tubes and manipulating their distribution more effectively.

The knowledge can ultimately be used in a myriad of applications, particularly where coating of surfaces with special properties is called for. Relevant fields range from nano-electronics and aerospace to medicine and biotechnology.

The project was coordinated by the Foundation for Theoretical and Computational Physics and Astrophysics in Bulgaria.

1 'Computer simulations of optical and transport phenomena in carbon nanotubes'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanosciences, nanotechnologies, materials & new production technologies'.  
<http://cordis.europa.eu/marketplace> > search > offers > 6700



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## 'Future factories' for improved chemical processing

*By refining techniques to process chemicals, many sectors across different industries are set to benefit from improvements in plants, micro-reactors, fabrication techniques and safety standards, among others.*

The EU-funded Copiride<sup>1</sup> project is looking at ways to improve these processes. It is developing a modular production and factory concept for the chemical industry that is based on flexible output and adaptation, an idea dubbed 'future factories'. This new concept involves looking at five key research areas — chemical catalysts, fabrication, reactors, plants and processes — to speed up production and make it highly adaptable to demand.

Copiride is examining the development cycle holistically, including safety, process control and plant approval. It is enabling plants to start up and shut down

rapidly; this makes them more multifunctional and encourages sustainability, in addition to improving time to market.

The project team is exploiting different chemical catalysts, such as those for polymers and bio-diesel, in more productive ways. It is also developing new processes, for example in sugar hydrogenation, polymerisation and bio-diesel production.

More efficient laboratory micro-reactors are also being tested, with demonstrations for laser-welded micro-reactors already developed. Moreover, Copiride is making headway in plant development, elaborating engineering



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schemes for different processes and chemical synthesis.

Project results will be disseminated through various media, including papers and conferences. Industrial exploitation will likely follow, with an improvement for end products in bio-diesel production, cleaning agents, polymer fabrication, and more.

The project was coordinated by the Institut für Mikrotechnik Mainz GmbH in Germany.

1 'Combining process intensification-driven manufacture of microstructured reactors and process design regarding to industrial dimensions and environment'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanosciences, nanotechnologies, materials & new production technologies'.  
<http://cordis.europa.eu/marketplace> > search > offers > 6696

## INDUSTRIAL TECHNOLOGIES

### Sophisticated sensors to improve motor performance

*Novel semiconductors have great potential to power sensors that will control both small and large motorised equipment. This will increase efficiency and save energy for a whole range of devices with motors.*

Electric motors, such as those in electric cars or those powering electronic devices, are the driving force behind equipment of all sorts. Accurate manipulation of these motors is necessary to ensure smooth functioning and precise control of speed, force, power and energy savings.

Normally, these motors are controlled by sensors that monitor the electric current. The high density of sensors often required and any temperature instability present can wreak havoc with these systems, particularly in industrial applications.

To solve this problem, the EU-funded IHACS<sup>1</sup> project is developing highly compact and efficient sensors that

are self-calibrating. The technology of these sensors is based on the 'Complementary metal-oxide semiconductor' (CMOS), building on breakthrough conductors founded a century ago by physicist Edwin Hall.

The new semiconductors developed by the project team have no ferromagnetic parts and are unaffected by fluctuating temperatures. The team is ensuring that the sensors will work in an environment that has any temperature with guaranteed stability between 150°C and minus 25°C.

They can be mounted significantly closer to motors and related equipment, a feature which reduces size. In more technical terms, the new



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sensors are capable of much more sophisticated magnetic field filtering and sensitivity boosting. IHACS is also integrating the new sensors in very small chips, yielding improved spatial sensing, lower costs and easier reproducibility.

The project has already developed the final version of the CMOS magnetometer-related sensor required to realise this initiative. Once the technology is fully exploited, the sensors are expected to enable a host of motorised equipment to work more efficiently and economically.

The project was coordinated by SENSAP Electronic Systems and Software Applications in Greece.

- 1 'Wide-band, self-calibrating, CMOS-integrated HALL magnetometer for current sensing applications'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> > search > offers > 6706



### Nano-crystals breakthrough

*The size and functionality of nano-crystals is indicated for overcoming — literally — barriers in nano-electronic applications. This 'breakthrough' is achieved with so-called tunnelling.*

The Innate<sup>1</sup> project studied the properties and capabilities of quantum-size metal nano-crystals as active elements in molecular electronic circuits. Researchers sought to demonstrate their novel electronic

functionality for such systems, by focusing on electrolyte gating at electrified solid/liquid interfaces. Following this, the EU-funded team set out to integrate functionality for configuration of a vertical scanning probe microscopy

and nanogap electrode set-up for nano-electronic circuit formation.

Innate project partners focused on the electrochemical and electronic behaviour of small 'Monolayer-protected clusters' (MPCs) of gold. Achievements included a first-time demonstration that well-behaved quantised charging of gold MPCs can be realised in an air- and water-stable room temperature ionic liquid. This is important from a technological point of view: ionic liquids offer near-zero vapour pressure and promising thermal and electrochemical stability.

Study of the quantised cluster charging process revealed that electrolyte selection is essential for optimal design of an electrochemical device. Other project experiments indicated the value in taking an electrostatic immobilisation approach for achieving electrostatically stabilised nano-crystals.

This is significant for applications in electro-analysis and catalysis.

Overall, the Innate project demonstrated the application potential of nano-crystal-mediated tunnelling for molecular electronics. Building on these achievements can enhance electrochemical methodologies in related areas of research and have great socio-economic impact in the future.

The project was coordinated by the Universität Bern in Switzerland.

- 1 'Integrated nanocrystal tunnelling for molecular electronics'.

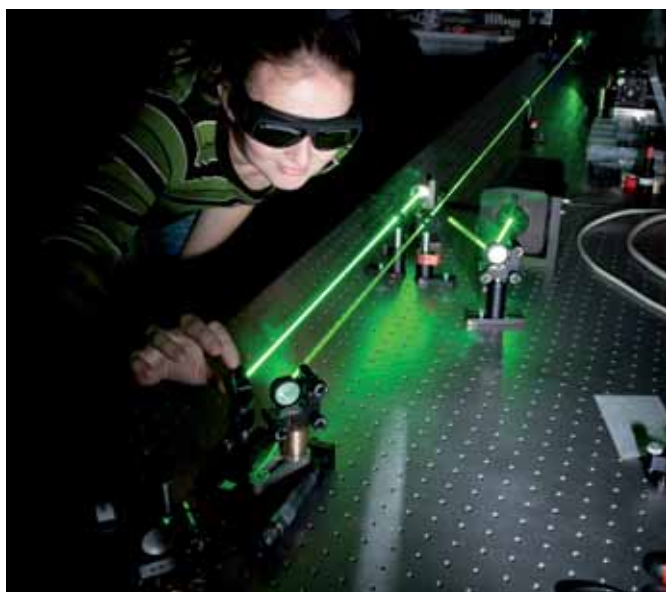
Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> > search > offers > 6811



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## Laser technology gets a boost

*Advanced laser technology research has yielded considerable knowledge that is paving the way for a number of new applications, from diagnostic medicine to defence.*



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Since its inception in 1976, the 'Free-electron laser' (FEL) has come a long way. This type of laser resembles conventional lasers but boasts the widest frequency range among lasers and is widely tuneable. FEL can be used

for a variety of X-ray and medical applications, as well as in defence applications. Sophisticated FEL facilities in Europe can therefore help advance these fields, bringing notable benefits to healthcare and to national security.

Under the EU-funded Eurofel<sup>1</sup> project, 16 European institutions came together to establish next-generation FEL light sources in Germany, France, Italy, Sweden and the United Kingdom. The project involved six modules investigating different aspects of FEL technology: electron guns and injectors, beam dynamics, synchronisation, harmonic generation, superconductivity and technology transfer.

In more specific terms, the project's first challenge was to design critical components for the FEL generation, such as the electron gun, injection system, optical system and electron bunch compression. It then worked on improving beam properties and characteristics of FEL sources. The laser's output characteristics were enhanced, and steps were undertaken to exploit the technology for industrial production of major components in a cost-effective manner.

Overall, the project required 223 person-years to complete, over half of which were funded by the EU. This enabled science graduates and scientists to participate in forefront research under a global consortium. The project published its results in 23 journals as well as through 230 conferences, workshops and presentations, paving the way to upgrading and exploiting this technology.

Today, FEL laboratories dot Europe, and experiments using their technology are continuing to help society and civilisation in several ways. Advances in diagnostic medicine and security have already emerged from FEL.

The project was coordinated by the Stiftung Deutsches Elektronen Synchrotron in Germany.

1 'European FEL design study'.

Funded under the FP6 programme  
'Research infrastructures'.  
<http://cordis.europa.eu/marketplace>  
search > offers > 6739

## Developing applications for new polymers

*Dendrimers are large man-made polymers whose atoms are arranged in branches and sub-branches radiating out from a central spine of carbon atoms. These new materials have been investigated by an EU-funded project for possible use in the fields of biomedicine and advanced molecular materials.*

Two approaches have been taken by the Dendreamers<sup>1</sup> consortium. The first has been to study the synthesis of 'Liquid crystal' (LC) dendrimers, which can change colour on exposure to light and alter their shape in the presence of an electric field. The second approach has been the use of fullerene-based LC dendrimers for the treatment of diseases.

The Dendreamers initiative will also coordinate the training of PhD and post-doctoral researchers, so that their valuable work

into the synthesis of new materials can be directly applied to the industrial sector. The training of personnel will accelerate the spread of knowledge within Europe through industrial collaboration.

Dissemination of skills and knowledge will help to increase the industrial application of new materials developed by universities and research bodies. This collaboration provides information about the latest techniques and developments, enabling better



© Laurent Dambies, Shutterstock

planning for current and future research. In addition, it will provide a valuable boost to the EU's growing knowledge economy.

The project was coordinated by the Universidad de Zaragoza in Spain.

1 'Functional liquid crystalline dendrimers: synthesis of new materials, resource for new applications'.

For further information:  
<http://ina.unizar.es/zeocell>  
Funded under the FP7  
specific programme People  
(Marie-Curie actions).  
<http://cordis.europa.eu/marketplace>  
search > offers > 6719

## EVENTS

### Conference on cell polarity and membrane traffic, Pultusk, Poland

*A conference on cell polarity and membrane traffic will take place from 31 March to 5 April 2012 in Pultusk, Poland.*

Cell polarity and vesicle sorting are fundamental biological processes that impact stem cell function, cancer, bacterial and viral infections, developmental defects and neurological diseases.

Early screens in model organisms identified many conserved genes necessary for cell polarisation, but initially these were not recognised as playing any role in vesicular transport. However, interdisciplinary studies from a number of laboratories have revealed exciting and unexpected links between cell polarity establishment and membrane traffic.

The event will seek to bring together stakeholders in order to encourage interactions, build new collaborations, and advance the field.

*For further information, please visit:*

<http://www.esf.org/index.php?id=9163>

### Fifth conference on deep sea corals

*The fifth 'Conference on deep sea corals' will take place from 1 to 7 April 2012 in Amsterdam, the Netherlands.*

Underwater exploration is expanding knowledge of deep sea, cold-water corals in a range of ocean settings. While there are nearly as many species of deep water corals as shallow water species, only a few deep water species develop traditional reefs. Instead, they form aggregations called patches, banks, bioherms, massifs, thickets or groves. These areas form very rich benthic habitats, of spectacular biodiversity, housing more coral species in deep cold-waters than in tropical coral reefs.

Deep water coral are widely distributed within the earth's oceans, with large reefs and beds in the far North and far South Atlantic, as well as in the tropics in places such as the Florida coast. Because of their function as a nursery for commercially important fisheries— in combination with increasing environmental pressures— cold-water corals, reefs and mounds need increasing attention and management.

The conference will be a forum for communicating and exchanging ideas on biodiversity and ecosystem conditions and solutions.

*For further information, please visit:*

<http://www.deepseacoral.nl/index.htm>

### Conference on 'Research and innovation: an agenda for a renewed partnership'

*The 'Research and innovation' conference will take place on 2 and 3 April 2012 in the World Trade Centre, Barcelona, in Spain.*

The recent developments on both sides of the Mediterranean Sea have created a new context and momentum for developing a new phase of cooperation and establishing a more strategic partnership in research and innovation. The conference will be opened by the EU Commissioner for Research, Innovation and Science, Mrs. Máire Geoghegan-Quinn and will be attended by other senior policy-makers from EU Member States and Southern Mediterranean countries.

*For further information, please visit:*

[http://ec.europa.eu/research/conferences/2012/euro-mediterranean/index\\_en.cfm](http://ec.europa.eu/research/conferences/2012/euro-mediterranean/index_en.cfm)

### 'Dust and grains in low gravity and space environment'

*An event entitled 'Dust and grains in low gravity and space environment' will take place from 2 to 4 April 2012 in Noordwijk, the Netherlands.*

Dust and grains are found in space and may be exposed to a variety of different environments. A broad community of scientists are researching the many facets of dust and grain physics and chemistry, with complementary objectives, tools and models.

This area of study is important because it is important to understand how dust and grains are formed, charge effects, aggregation kinetics, optical properties, interactions with a local environment, compaction mechanisms, mechanical properties and other related areas.

The workshop will be a forum for stakeholders to discuss dust and grains in the space environment, including:

- dust in rocky environment;
- icy and refractory environments;
- free-floating environments.

*For further information, please visit:*

<http://congrexprojects.com/11M24>

## StandarDays

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*An event entitled 'StandarDays' will take place from 17 to 18 April 2012 in Brussels, Belgium.*

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The main topics of this two-day event are 'Introducing European standardisation' and 'For a better understanding of European standards'. The second day includes a break-out session on 'Standards as a support tool to FP7 projects'.

*For further information, please visit:*

<http://www.cen.eu/cen/News/Events/Pages/StandarDaysApril2012.aspx>

## 3rd Marine Board Forum

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*The 3rd Marine Board Forum will take place on 18 April 2012 in Brussels, Belgium*

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The 3rd Marine Board Forum is designed to examine emerging or future "Blue Technologies". In this case, blue technologies are those technologies which will either be used in, or drawn from, the seas and oceans and which should have the potential to make a transformational or step-changing contribution either to marine science itself or to society.

*For further information, please visit:*

<http://www.esf.org/index.php?id=9292>

## Transport Research Arena 2012

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*The Transport Research Arena 2012 will be held from 23 to 26 April 2012 in Athens, Greece*

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The Transport Research Arena (TRA) 2012 serves to enable the exchange of knowledge among those who play an active role in the transport sector. TRA 2012 will focus on all aspects of all surface transport modes with the exception of overseas shipping. It provides experts from different disciplines with a forum for creative discussions about the future of transport at a location where Greek philosophers debated the burning issues of the day some 25 centuries ago.

The main theme of TRA 2012 is 'Sustainable mobility through innovation'.

*For further information, please visit:*

<http://www.traconference.eu/>

## 'Group exhibit hydrogen and fuel cells' (H2+FC 2012)

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*The 'Group exhibit hydrogen and fuel cells' (H2+FC) exhibition will be held from 23 to 27 April 2012 at the Hannover Messe in Hannover, Germany.*

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The latest developments in stationary, portable and mobile fuel cells, as well as fuel cell applications, components, test systems, hydrogen production, transport, storage and infrastructure, reformers and beyond, will be on display at Europe's largest H2+FC exhibition.

Around 150 companies and institutions from around the globe will showcase a full spectrum of hydrogen and fuel cell-related products, many of them participating in FP6 and FP7 research. The 'Fuel cells and hydrogen joint undertaking' public-private partnership (PPP) will also be present.

*For further information, please visit:*

<http://www.h2fc-fair.com/hm12/exhibitors/index.html>

## Teaming up for Renewable Heating and Cooling

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*An event titled 'Teaming up for Renewable Heating and Cooling' will be held from 26 to 27 April 2012 in Copenhagen, Denmark.*

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The European Technology Platform on Renewable Heating and Cooling (RHC-Platform) is teaming up with Euroheat & Power to organise its 2012 Conference on Renewable Heating and Cooling. The Conference is co-funded by the European Commission in the framework of its financial support to the activities of the RHC-Platform. The event will gather experts from all over Europe to explore the possibilities for smart cities to make use of renewable energy and district heating and cooling, to provide comfort to their citizens and foster the local economy

*For further information, please visit:*

<http://conference2012.eu/>

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