



European Commission

ISSN 1831-9947

No 2 May 2011

# research<sup>eu</sup>

## RESULTS MAGAZINE

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### Special feature



*Energy and resources: alternatives, renewables, generation, distribution...efficiency all the way!*

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Publications Office

**Published by**  
CORDIS Unit  
Publications Office of the European Union  
2, rue Mercier  
2985 Luxembourg  
LUXEMBOURG  
E-mail: [research-eu-results-magazine@publications.europa.eu](mailto:research-eu-results-magazine@publications.europa.eu)

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All issues of the *research\*eu results magazine* are available online at:  
<http://cordis.europa.eu/news/research-eu>

The *research\*eu results magazine* is published by the Publications Office of the European Union, as part of the EU-funded research programmes. Content is prepared using several sources, including the Technology Marketplace on CORDIS, and Research Information Centre, as well as original material collected specifically for this publication.

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## A greener future with new technology

*Conventional sources of energy like gas, nuclear and oil still dominate the world's demand. But if demand continues to increase the way it has, more radical changes in the way we produce and consume energy will be needed.*

*As parts of its overall agenda to create a smart, sustainable and innovative Europe, the EU is actively engaged in seeking new technologies. Some of these technologies will introduce novel alternative energy sources and increase energy efficiency, generation and distribution. Reducing the carbon footprint will also require the very best in green technology and processes.*

*In the EU, research is underway to develop the latest energy technologies. We wanted to highlight the wonderful work being conducted across the 27 EU Member States along with its international partners. This is why we decided to dedicate this issue of research\*eu results magazine to 'Energy and resources: alternatives, renewables, generation, distribution...efficiency all the way!'*

*We start off the issue by looking at the possible correlation between mobile phones and brain tumours in adolescents. The article, listed in the biology and medicine section, discusses how one EU-funded project will help shed light on any possible negative effects of electromagnetic radiation.*

*The energy and transport section leads with an innovative study into a promising alternative fuel for environment-friendly energy production.*

*History often reveals patterns that future generations can learn from. This is indeed the case in the top story in the environment and society section. An EU-funded project has found links between climate change and ancient societies.*

*In our IT and telecommunications section, we see how European research helps industry to bridge the divide between what happens in the physical world and its representation in the digital world.*

*The industrial technology section leads with a story on a project that is developing the latest in robots. The project, PISA, has built a powerful robotic arm that is able to pick up a delicate egg without breaking it.*

*The issue then ends with a list of exciting events and upcoming conferences in the field of research and technology.*

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

*The editorial team*



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## Frequent acronyms

ERA	European research area	ICT	information and communication technologies
FP5/6/7	Fifth/Sixth/Seventh Framework Programme of the European Community for research, technological development and demonstration activities	IST	information society technologies
		R & D	research and development
		SMEs	small and medium-sized enterprises





## Investigating cancer, mobiles and kids

*An international group of researchers is studying the incidence of brain cancer in adolescents to see if mobile phones and environmental factors play a role.*

Brain tumours are the second most common malignancy suffered in childhood — after leukaemia. And their incidence has been increasing. Luckily, survival has improved too, but prevention of brain tumours is still an important goal, though one that presents a huge challenge.

One problem is that little is still known about risk factors for brain tumours. Some risk factors have been identified, such as exposure to ionising radiation and a family history of brain cancer, but the impact and implications of these risks needs to be understood better. Even less is known about other potential environmental risk factors, such as exposure to chemicals, maternal nutrition during pregnancy or exposure to electromagnetic fields including cellular/mobile phone use.

'With respect to the latter, the use of cellular phones and other communications technologies has increased dramatically over the last decade, especially among children and its role in the development of brain cancer in young people has yet to be studied thoroughly,' notes Dr Elisabeth Cardis, research professor in radiation epidemiology at Barcelona's 'Centre for research in environmental epidemiology' (CREAL) and coordinator of the EU-funded Mobi-kids (<sup>1</sup>) project.

Mobi-kids studies the risk of brain cancer from exposure to radiofrequency (RF) fields in childhood and adolescence. The project is looking at RF and extremely low-frequency (ELF) radiation from mobile communications technology and other important sources of electromagnetic fields (EMF), and it will study other potential risk factors, too.

To do this the team developed an international multi-centre study involving experts from 13 European and non-European countries. Large scale is an important aspect of the project. The small number of children included in previous studies has been a significant limit to progress. Though it is fortunately still a rare disease, 'the frequency of brain cancer may have increased in young people over recent decades,'

notes Prof. Cardis. 'We need international studies to answer these types of research questions.'

### Cost efficient

By developing a large-scale international study, researchers are able to access a much larger number of cases. Nearly 2 000 young people between 10 to 24 years of age with brain tumours and a similar number of young people without a brain tumour will be invited to participate in the study, which is running over five years.

About 1 400 of these cases will come from European countries and Israel, while the rest will be recruited in Australia, Canada, New Zealand, Taiwan and possibly India and Japan. 'The proposed age range is also the most cost efficient to answer the question of brain cancer risk from exposure in childhood and adolescence,' Prof. Cardis emphasises. Tumours take years to develop and this means that it makes little sense to study tumours in very young children.



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*'So far most of our work has been dedicated to the development, testing and optimisation of the study documents like protocols, questionnaires, and supporting material.'*

The project will take advantage of well-established protocols from the 'International case control studies of cancer in relation to mobile telephone use' (Interphone) study project, another European-funded project that created a series of multinational case-control studies to assess whether RF exposure from mobile phones was associated with cancer risk at all ages, not just for children. Interphone promises a major advance in epidemiological research of mobile phone use. The Interphone study was the largest mobile phone and brain cancer study of its time when it was launched in 2000. It questioned 6 420 people with various brain cancers and 7 658 people without brain cancer about their history of mobile phone use, to provide a definitive result for the risk of brain cancer from such use.

That was not possible, however. Though state-of-the-art at the time, as research progressed it became evident that there were a number of potential biases, typical to epidemiological studies, which could affect the interpretation of results. The first issue was potential recall bias, where cancer victims overestimate their mobile use, for example, or selection bias, where people may not have agreed to participate in the study because they did not use mobile phones and therefore thought their input would not be relevant.



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These and other issues made it difficult for the Interphone study to reach definite conclusions, but it did offer enormously useful lessons on study design and methodology which Mobi-kids has taken onboard. The project will not only deepen our understanding of electromagnetic radiation but will also illuminate research methods themselves.

Mobi-kids is a case-control study, where people who have developed the disease are identified and their past exposure to potential risk factors is compared to people who do not have the disease (controls).

Selection bias is a potential problem but the project plans to overcome this by selecting hospitalised controls with appendicitis (i.e. controls who are representative of the general population and unrelated to mobile phone use).

To address the recall bias, Mobi-kids has planned more detailed validation studies, where possible, validating cell-phone usage with the help of mobile network operators, and repeat questionnaires on a sample of subjects. Allied to this, the team has started some fundamental, experimental work, for example looking at improved exposure indices. These will take account of the spatial distribution of energy in the brain at different ages, a considerable increase in study configuration.

'So far most of our work has been dedicated to the development, testing and optimisation of the study documents like protocols, questionnaires, and supporting material,' Prof. Cardis reveals. 'We also set up our scientific coordination through meetings of the consortium, sub-committees and task groups and contacts with relevant clinicians at the national level. We now have an extensive network of collaborators in the process of obtaining ethics approvals and, where these are already obtained, of starting the field work.'

Mobi-kids has also started EMF exposure assessment, beginning with experiments to develop protocols for mobile phone-EMF exposure modelling. Work also began on the development and optimisation of the study database, computer assisted interviews and data validation tools.

Finally, the team has developed a project communication plan together with a project webpage ([www.mbkds.net](http://www.mbkds.net)) that provides information to the public as well as an essential communication tool to the researchers in the project.

The Mobi-kids project is funded under the Environment theme of the EU's Seventh Framework Programme (FP7) for research.

(1) 'Risk of brain cancer from exposure to radiofrequency fields in childhood and adolescence.'

## Uncovering the switches that turn tumours on and off

*Several genes, proteins and mechanisms have been implicated in activating or inactivating tumours. New treatments for cancer may be next.*

Tumours are growths that form on or in the body, and can be benign or malignant in nature. Primary tumours are usually highly malignant and can spread to other locations in the body. A close understanding of how they become invasive and metastasise (spread) in the body can help develop treatment for serious cancers.

Generally, metastatic tumours can be diagnosed when specific genes in the body become inactivated and others are activated. However, live testing in mice and humans has shown that manipulating these specific genes did not trigger malignant transformation. This indicated that additional unknown factors are required for this process to take place.

over growth, evading programmed cell death, tissue invasion and metastasis have been found in tumorous eye tissues of *drosophila*. This provided a powerful experimental model for the genetic dissection of tissue homeostasis, growth and cancer in vivo.

The project team managed to partly unravel the molecular steps involved in *drosophila* eye tumours and how they could be triggered. Several very specific mechanisms have been identified at a molecular level, including a gene in *drosophila* that can act as a tumour suppressor. Specific proteins were also implicated in tumour-related activity, in addition to other mechanisms related to gene formation.

Together, these findings are considered very important in bringing the medical research community closer to understanding metastatic tumours and embarking on a quest for a cure. Positive results in this respect may be just a few years away.

(1) 'In vivo studies and screens for new factors that promote or suppress tumor metastasis.'

Funded under the FP7 specific programme People (Marie-Curie actions).

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The Findmetastasis <sup>(1)</sup> project, funded wholly by the EU, recently explored animal models that traced the steps in malignant transformation of tumours. Its aim was to conduct in vivo (laboratory) studies to screen for new factors that promote or suppress tumour metastasis.

A good place to start looking for these factors was in *drosophila*, the common fruit fly. Hallmarks of cancer such as

## High-tech imaging to detect heart disease more efficiently

*A new system with combined technologies promises to reveal the exact extent of heart disease in patients, thanks to non-invasive 3D imaging of mitochondria in insulin resistance (IR).*

Ischemic heart disease (IHD) is characterised by reduced blood supply to the heart, usually due to hardening of the arteries. It is one of the most common causes of death in Europe.

Armed with significant funding from the EU, the Evinci-study <sup>(1)</sup> project is testing a novel non-invasive cardiac imaging system for detecting and characterising IHD. The three-year study is enrolling 700 patients with suspected IHD to test and validate this new imaging system. It uses what is known as multi-slice computerised tomography, based on magnetic resonance,

ultrasound and radiological technologies. This reveals different three-dimensional layers and angles of affected organs.

The study protocol has already been implemented in 13 participating clinics in nine EU countries. It also developed standardised cardiac imaging guidelines, reached by the consensus of European stakeholders. Evinci-study also set up a computer-based information network among participating clinics with a central server that stores observations and results. This network is also connected to a

database for statistical analysis. All imaging raw data are also stored in a central digital bank in a standardised and anonymised format.

In addition, anonymised biological samples coming from the clinics are stored in a secured central biological bank.





This repository of imaging data and biological samples has been a major achievement of the project.

While the new imaging system is much less invasive than current traditional testing methods, it still carries some procedural and/or radiological risks. This is why Evinci-study is undertaking a cost-benefit analysis. Any risk from the procedure itself or from radiation is being evaluated. Particular care is being taken to include in each imaging report the actual radiation dose received by the patient.

Moreover, the Evinci-study is also developing novel software for integrated representation of anatomic information derived from this multi-modal cardiac-imaging system, combined with clinical and biological information. The structure of the software has already been elaborated, and co-operation between centres with recognised expertise in the relevant field has been launched.

To disseminate the Evinci-study contents, the European Society of Cardiology established a website and project

partners are participating in relevant forums and events. The final outcome of Evinci-study should result in more sophisticated and more comfortable diagnosis of ischemic heart disease than ever before.

(1) 'Evaluation of integrated cardiac imaging for the detection and characterization of ischemic heart disease.'

Funded under the FP7 specific programme Cooperation under the theme Health.

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## Blind see with sound

*New and innovative technology could one day bring vision to the blind. Today, EU-funded scientists are looking at ways of transforming sound into more than just blurred visual cues in the brain.*

Software has already been developed to aid in the visual interpretation of sound. Sensory substitution devices (SSDs) capture visual information and transform it into non-visual information. An artificial receptor then delivers the information to the brain where an individual can more or less guess its physical dimensions. While such devices aid the visually impaired and the blind, they are currently unable to provide any accurate detail.

But the EU-funded project, Sight to sound, hopes to advance the technology behind SSDs and vastly improve the 'visual' capacity of the blind to

interpret the sound. They intend to do this by combining the methodologies of functional magnetic resonance imaging (fMRI) with transcranial magnetic stimulation (TMS). The combined methodologies will help researchers target 'open tissues in object recognition, object localisation, sensory perception, cross-model interactions and brain plasticity,' write the researchers. Once these targets are located, they will then use enhanced SSDs to guide the visual cortex to read and interpret visual information. Enhanced SSDs will also be better optimized for neuro-ophthalmology rehabilitation.

According to the researchers, the visual system is comprised of two parallel processing streams — the dorsal pathway stream and the ventral stream. The dorsal pathway stream analyses the spatial aspects of visual landscapes and visually-guided hand movements. While the ventral system is primarily concerned with information related to the identification of objects and faces write the researchers. They also explain that the blind have a tendency to use their visual cortex more often than sighted people. The discovery could have far reaching implications because it sheds light on the adult brain's plasticity and how it organizes itself say the researchers.

But first, Sight to sound needs to better understand the neural basis of visual-to-auditory transformation. To do so, they have developed a unique training program that teaches congenitally blind individuals to view and interpret pictures and streaming visual information. The participants first begin to recognize simple shapes like lines or boxes. The shapes then increase in complexity until finally they begin to recognize 'real-life objects, people and environments and their location in space.'

The work by Sight to sound is bringing tangible hope. Their research, once complete, could have immense future implications. By enabling the occipital cortex to revert visual perception, sight restoration could one day be a reality.

Funded under the FP7 specific programme People (Marie-Curie actions).

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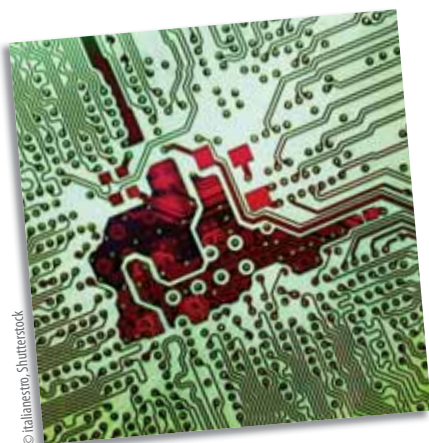


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## Is nano-medicine good for you?

*Dialogue with patients and stakeholders prepares the ground for reliable two-way communication on the benefits and risks of nano-medicine.*



Nano-medicine is a fascinating field that promises medical treatment based on nanotechnology. It involves very tiny particles used in medically-related materials, medications and biosensors, as well as molecular nanotechnology. However, this technology is not without its unknowns and risks. This is why a safe, responsible approach is needed to develop nano-medical research in Europe.

To address this challenge a project called the Nanomed round table <sup>(1)</sup> brought together expert stakeholders from across Europe to probe different topics in nano-medicine. The discussions

revealed that patients are open to nano-medicine and want to know more about it from reliable sources. The European Commission, national governments, and trade and research associations all have a role to play in ensuring dialogue with patients.

Ethical and societal aspects were also discussed at the round table, outlining the need to inform all stakeholders on the philosophical and social aspects of nano-medicine and its purpose. These stakeholders included nano-medical researchers, physicians, patients, and policy-makers.

The round table identified the need for reliable data to predict the economic impact of nano-medicine on healthcare costs and benefits, as well as on market growth. This enables the European Medicines Agency to take strategic decisions early on. It also allows national governments to manage finances more efficiently.

In addition, the project concluded that a proactive regulatory system is required for better coordination and harmonisation of regulatory procedures. This would involve dialogue with users and

stakeholders at early stages of research and developing, and account for the economic cost implications of regulation. The project has outlined who is best fit to play this role.

Lastly, the round table has identified 45 different types of products based on nano-medicine that are already on the market. The policy recommendations emerging from this exercise can serve as a timely and substantial response to the need for genuine engagement and involvement of all the key stakeholders (public and private) in the nano-medical field.

Now that nano-medicine has become a reality, the results of this project will prepare the groundwork for optimised, collective decision making at the European level.

(1) 'Nanomedicine ethical, regulatory, social and economic environment'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanoscience, nanotechnologies, materials and new production technologies.'

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## A sigh of relief for asthma and allergy sufferers?

*EU-funded researchers are shedding new light on the environmental factors that offer protection against asthma and allergies. Their findings feed into efforts to find new ways of preventing these debilitating conditions.*

Some 80 million people across Europe suffer from some kind of allergy, and 30 million have asthma. What's more, these figures are on the rise. Experts estimate that by 2015, one in two Europeans are likely to have at least one form of allergy.

As well as diminishing patients' quality of life, allergies and asthma have significant socio-economic costs, in the form of healthcare use, medication, and absences from work or school. Although these conditions can be managed, there is as yet no cure.

Scientists know that the environment in early life strongly influences an individual's risk of developing allergies or asthma. Studies have shown that children raised on farms are much less likely to develop these conditions than other youngsters. However, the scientists currently lack information on the precise biological substances that confer protection.



Enter the European project 'Mechanisms of early protective exposures on allergy development' (Efraim), which is following a cohort of 1 000 rural children, half of them born on farms, from across Europe.



The children have been studied from birth, initially under the EU-funded Pasture project and now under Efraim.

Questionnaires provided the researchers with detailed information on environmental exposures and the onset of any allergic symptoms. Samples of house dust and cows' milk as well as the children's blood have also been collected.

During its second year, the Efraim team embarked on analyses of the dust, milk and blood samples. In addition, the researchers continued their investigations of protective mechanisms in the gut and completed measurements of potentially protective factors in breast milk.

The Efraim project's findings contribute to efforts to find ways of preventing asthma and allergies, through

the development of special milk formula and a vaccine possibly based on a species of bacteria, *Lactococcus lactis*, which has strong anti-allergy properties.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy.'

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## Cost control in European hospitals to streamline resources

*By comparing hospital systems within the EU, high-cost departments and gaps can be identified. This can lead to more hospital efficiency and better Europe-wide harmonisation.*

DRG stands for diagnosis-related group. It is a system that classifies hospital cases or patients into groups that can use the same resources. In other words, the system relates the types of patients treated to the resources they consume in order to realise economies of scale. DRG systems assess the costs of patient treatment, taking into account measurable patient characteristics such as diagnosis, complications, co-morbidity (additional diseases present) and treatment.

The 'Diagnosis-related groups in Europe: towards efficiency and quality' (EURODRG) project, funded generously by the EU, is studying factors such as wage levels against established patient variables and procedures in hospitals across 10 EU countries. This can help health care authorities understand the variation in costs among European

hospitals and allow comparisons to ensure that DRG systems are providing the intended incentives.

The project is also examining the role that quality of care plays in explaining costs, an area with practically no European studies but potentially important policy implications.

The project examined existing mechanisms for measuring and explaining differences in hospital costs. Also, to establish comparisons of DRG-systems across Europe, each participating country drafted a country report using a structured template. Cross-country comparisons of important issues concerning DRG systems (e.g. cost accounting, innovation, efficiency, and quality) were then undertaken based on results from the country reports.

Both country reports and thematic papers are to be edited for publication in a book on DRG systems in Europe. The book is scheduled for publication with Open University Press in 2011.

Results such as frequency of occurrence, treatment patterns, and DRG classification of patients were analysed using a standardised questionnaire. Consequently, articles comparing patient classification in different countries' DRG systems have already been submitted to medical journals.

The project is making important headway in advancing the state of the art. It is also enhancing cooperation between researchers in Europe and beyond to promote integration and excellence of European research in the field. This is meant to help Member States better organise their health systems and empower policy- and decision-makers to better manage and reform health care systems.

Overall, the project partners have made considerable progress in achieving its objectives so far. The work of the consortium is increasingly being recognised in the academic community through participation in several international conferences. Project publications have appeared in policy/management-oriented journals such as *EuroObserver*, published by the European Observatory on Health Systems and Policies. Other publications in peer-reviewed academic journals will follow in 2011 and beyond.

Funded under the FP7 specific programme Cooperation under the theme Health.

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## Half of emergency doctors will suffer burnout

*One in two emergency care doctors will suffer a burnout during their career, according to a survey of French physicians, published online in Emergency Medicine Journal.*

The research was funded in part by the 'Sustaining working ability in the nursing profession — investigation of premature departure from work' (Next nurses exit study) project, which received more than EUR 2 million under the 'Quality of life and management of living resources' Programme of the EU's Fifth Framework Programme (FP5).

Researchers asked over 3 000 salaried doctors to complete an online survey to assess their working conditions, job satisfaction, and health and well-being. Of these, 538 were emergency care specialists, and the rest were randomly selected to match the age, gender, and regional profile of France's physicians and their distribution by specialty, so as to provide a representative sample. The specialties represented included intensive care and anaesthetics, medicine, surgery, psychiatry, geriatric medicine, radiology, preventive medicine and pharmacy.

The responses showed that the prevalence of burnout was high, with 1 in 2

emergency care doctors identified as suffering from it, compared with more than 4 out of 10 of the representative sample. Physicians had the highest burnout rate in the two age groups, between 35 and 44 and between 45 and 54.

Poor work-life balance and dysfunctional teams were most strongly associated with burnout, both of which were more common among emergency-care doctors than other types of medical practitioners.

The tension between home and working life was more than four times as likely to feature in the responses of burnt-out physicians, but it was more than six times as likely to be a factor for emergency care doctors who were burnt out. The degree of burnout increased with tension.

Similarly, poor teamwork more than doubled the risk of burnout among the representative sample, but it increased this risk more than five-fold among emergency-care doctors. Likewise, physicians dissatisfied with their pay

among the representative sample declared more burnout compared to those who were satisfied, and this relationship was even stronger for emergency physicians.

There were fewer females among the emergency-care respondents. The females were also younger than the doctors in the representative sample. But more female doctors were burnt out than males. Female physicians' burnout score was higher among the representative sample and emergency-care physicians: 49.1 % of female physicians versus 37.5 % of male physicians of the representative sample, and 65.5 % of female physicians versus 43.2 % of male emergency physicians.

Burnt out emergency-care doctors tended to have a less active social life, to smoke more, eat a less healthy diet and to skip meals during the day more than the sample. Higher burnout scores were also associated with less time for continuing professional development. The results showed that 17 % of the sample intended to leave medicine, rising to over 21 % of emergency-care doctors. Indeed, burnout more than doubled the risk of physicians wanting to leave the profession altogether.



The researchers said these results were important as France is facing a shortage of available physicians due to an ageing population and the lack of a proportional increase in the training of doctors. Subsequently, emergency-care physicians are the medical system's first line of defence. The researchers said that in order to prevent the premature departure of French doctors, the work-family balance must be improved. They also called for the introduction of collaborative working processes and multidisciplinary teamwork.

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## High-protein diet is secret to losing weight

*EU-funded researchers have made an interesting discovery about what it takes to lose weight. People should maintain a high-protein diet with plenty of lean meat, low-fat dairy products and beans, and eat fewer finely-refined starch calories, such as white bread and white rice, according to researchers from the University of Copenhagen, Denmark.*

The study, the world's largest to focus on diet, was funded in part by the 'Diet, obesity and genes' (Diogenes) project which clinched EUR 15 million under the 'Food quality and safety' thematic area of the EU's Sixth Framework Programme (FP6). The findings are published in *the New England Journal of Medicine*.

The researchers of the large-scale random study investigated the optimum diet for preventing and treating obesity. The scientists, headed by the Faculty of Life Sciences at the University of Copenhagen, compared the official dietary recommendations in Europe with a diet based on the latest knowledge about the importance of proteins and carbohydrates for appetite regulation.

Nearly 800 European families participated in the study, including 938 adults and 827 children. The overweight adults initially followed an 800 kilocalories (kcal) a day diet for eight weeks, losing an average of 11 kilograms (kg). The researchers then randomly assigned the participants to follow one of five different low-fat diet types for six months to test the most effective diet type at preventing weight regain.

The five diet types tested were a low-protein diet with a high glycemic index (GI); a low-protein and low-GI diet; a high-protein and low-GI diet; a high-protein and high-GI diet; and a control group that followed the current dietary recommendations.

The GI is a measure of the ability of carbohydrates to increase blood glucose levels when absorbed in the body. Food with a low-glycemic index causes blood glucose levels to increase more slowly compared to high-carbohydrate foods with a high-glycemic index.

Drastic increases in blood glucose levels give rise to several potentially undesirable effects that can influence the body's metabolism and our ability to perform mentally, the researchers said.

They explained that the GI applies to carbohydrate-containing foods. The dieters were encouraged to consume some types of fruit, such as apples, pears, oranges, raspberries and strawberries freely, but to limit their intake of other types, like bananas, grapes, kiwi, pineapple and melon. They were allowed to eat most vegetables, with the exception of corn which was limited. They were also told to choose whole-grain cereal-based foods. Meanwhile, they were advised that potatoes should be cooked as little as possible — if available they should be new and eaten cold, while mashed and baked potatoes should be avoided. The researchers added that meals should be accompanied by water or low-fat milk.

'There is nothing particular about this diet,' bar certain limitations, special cooking instructions and the fact that certain vegetables should be eaten raw, they pointed out. 'This diet generally complies with the official

dietary recommendations of eating plenty of fruit and vegetables, low-fat foods, plenty of fibre and limiting sugar intake.'

At the end of the six months, the average weight regain among all participants was 0.5 kg, but among the participants who completed the study, those in the low-protein/high-GI group showed the poorest results with a significant weight gain of 1.67 kg. The weight regain was 0.93 kg less for participants on a high-protein diet than for those on a low-protein diet and 0.95 kg less in the groups on a low-GI diet compared to those on a high-GI diet.

From the children who simply followed the same diet as their parents, the researchers noted that in the group that maintained a high-protein low-GI diet, the prevalence of overweight dropped spontaneously from around 46 % to 39 %, a decrease of around 15 %.

The scientists concluded that current dietary recommendations are not optimal for preventing weight gain among overweight people. They also concluded that a diet consisting of a slightly higher protein content and low-GI food is easier to follow. This would help ensure that overweight people who have lost weight maintain their weight loss.

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## Using light and sand to kill waterborne viruses

*Research supported by the European Union has identified a technically and financially viable solution for wastewater treatment in developing countries.*

Basic sanitation is unfortunately still lacking in many parts of the world. Low-cost technology is the only way forward. Manmade wetlands employ natural methods to purify wastewater, but little is known about their ability to inactivate pathogens, particularly waterborne viruses.

Important research in this area was carried out with the context of a Marie Curie fellowship. The EU-funded project Parvirdis <sup>(1)</sup> used molecular biology techniques to determine the effects of different types of treatment on viruses.

The method of quantitative polymerase chain reaction was used to measure damage to the genome of a test virus following exposure to heat, ultraviolet (UV) light and a reactive oxygen species. UV light turned out to be the

most effective at rendering the virus ineffective.

Building on previous research showing that viruses readily attach themselves to metal oxides through a process called adsorption, an iron-oxide coated sand (IOCS) was tested during Parvirdis. While highly effective at trapping viruses in the laboratory, the IOCS did not fare as well in the wetland environment where pH and other water properties were not as ideal.

However, when IOCS was combined with exposure to sunlight, the results were impressive. This is due to the local production of elevated concentrations of the highly-reactive hydroxyl radical, which knock the viruses out of commission.



These findings are being applied to the development of a new concept for constructed wetlands for the treatment of wastewater.

(1) 'Enhancing natural wastewater treatment systems: the role of particles in sunlight-mediated virus inactivation'.

Funded under the FP7 specific programme People (Marie-Curie actions).

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## Intercepting the hidden orders of genes for better crops

*Epigenetics allows us to understand the instructions that genes are receiving in plants to help us grow improved crops.*

Many biological factors are passed down from generation to generation, whether in plants, animals or humans. The field of genetics, which studies DNA, is one way of understanding these changes and tweaking them in some cases. But there is another way to examine changes among generations, through a relatively new field called epigenetics.

In contrast to genetics, the field of epigenetics does not look at changes made by DNA, but at those made by cell

material sitting just outside the genome or DNA. This epigenetic material is what tells genes to switch on or off, to tread lightly, or to activate themselves. Interestingly, environmental conditions affect these epigenetic marks that pass gene instructions from one generation to the next.

The Aeneas <sup>(1)</sup> project, backed with EU funding, is looking at how plant types are changing and evolving due to epigenetic reactions. It is investigating how environmental cues activate specific epigenetic mechanisms and alter the genes of plants.

The project has begun examining these changes in *Arabidopsis*, a plant related to mustard or cabbage. How do epigenomics — the study of epigenetics — transfer their

information and what is the result in terms of lifespan? Aeneas is attempting to answer these and other questions by establishing and focusing on regulatory pathways involved in the changes.

This is done by subjecting the plant to stress tests like environmental changes such as temperature. Once the answers are clear for the model crop of *Arabidopsis*, the Aeneas research team will transfer the tests and results to maize, a much more common crop and staple in the EU. Eventually, the results will help design the next generation of breeding programmes based on the exploitation of environmentally induced epigenetic variability. This may offer an interesting alternative to genetically modified corn, as it does not involve mixing genes of another plant or organism into the maize.

(1) 'Acquired environmental epigenetics advances: from *arabidopsis* to maize'.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy'.

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See page 25 'Better agriculture for a new Europe'



## Nano-structured electrolyte membrane boosts fuel cell technology

*A European project has developed a nano-structured electrolyte membrane to aid the development of polymer electrolyte membrane (PEM) fuel cells (PEMFC). They represent one of the most promising alternative fuels for environmentally-friendly energy production.*

In the fight against climate change, PEMFC technology could play a key role by offering an environmentally friendly way of producing energy. However, the technology is currently stalled by the lack of development of improved and mass manufacturable electrolyte membrane materials that are capable of withstanding temperatures in the range of 130 to 200 °C.

It has been proven that operating at temperatures over 120 °C could overcome most of the functional problems currently associated with PEMF technology. These problems

include catalyst carbon monoxide (CO) poisoning, water management, efficiency — namely polarization effects and electrochemical reaction rates — and cogeneration possibilities.

The Zeocell <sup>(1)</sup> project offers a way of reducing these limitations by using multifunctional nano-structured materials. It proposes the synergic combination of microporous zeolite-type materials, protic ionic liquids (PILs) and conducting polymers to overcome existing drawbacks.

The electrolyte membrane architecture plays a significant role. To ensure the best individual properties of each component material, researchers investigated two different porous structures for the final nanostructured electrolyte membrane. These structures are namely random versus straight pores. For microporous material synthesis, they avoided the addition of any organic template molecules to eliminate the costly final step of calcination or extraction.

According to project results, the synthesised PILs — which exhibit decomposition temperatures above 300 °C — have enormous possibilities, not only as embedded proton carriers due to their promising conductive properties, but also as additional chemicals in the composite membranes fabrication route to improve the final performance of the PEMFCs.

Indeed, the research team insists that 'the best dual systems and optimal experimental procedures' have been selected to prepare the final nano-structured electrolyte composite membrane. Subsequently, a complete procedure for the preparation of nano-structured electrolyte composite membranes for high-temperature PEMFCs has been established.

(1) 'Nanostructured electrolyte membranes based on polymer-ionic liquids-zeolite composites for high temperature PEM fuel cell'.

Funded under the FP7 specific programme  
Cooperation under the theme Energy.

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## Sweet success of second-generation biofuel

*Second-generation biofuels may hold one of the keys to unlock Europe's objective of becoming more energy and resource efficient by 2020. But today a number of hurdles prevent second-generation biofuels from being commercialised and fully exploited.*

Second-generation biofuels are made from lignocellulosic biomass. Sugarcane bagasse — the fibrous material by-product of crushed stalk, and straw — are examples of lignocellulosic biomass. Other examples of lignocellulosic biomass include tree bark, corn stover and wood chips.

Yet, to date, and despite the promises of second-generation biofuels and the availability of the technology, no one has successfully scaled up the process to convert biomass waste into a commercially viable fuel. Several EU-funded research projects are currently on the case.

One of those is the 'Conversion of sugarcane biomass into ethanol' (Canebiofuel) project, a consortium of leading companies and universities from Europe and South America. Canebiofuel has produced some very promising results that could one day make sugarcane bagasse and sugarcane straw commercially viable sources of bioethanol.

### Cost-benefits of second-generation biofuel

The project's ultimate goal was to create an innovative, cost-effective and industrially viable process for converting sugarcane biomass into fermentable sugars. Today, extracting ethanol from bagasse or wood chips is prohibitively expensive. The costs alone discourage their use and production. Industry and consumers are unlikely to pay extra for a product they can get cheaper elsewhere and by different means.

'All the players worldwide have been trying to drop second-generation production costs down to the ones of first generation. Enzymes, pre-treatment technologies and yeast strains have been improved,' says Benjamin Rærup Knudsen, Canebiofuel's dissemination and exploitation manager. But Mr Knudsen believes more funding

from public and private sectors, along with clear political decision-making, is needed to turn second-generation biofuels research into a truly marketable product.

Canebiofuel is studying the structural components of sugarcane biomass. What was once discarded as waste or used for cogeneration should one day produce clean and inexpensive ethanol fuel. Canebiofuel is one of the first to explore sugarcane straw as a lignocellulose source. According to the researchers, one tonne of sugarcane produces 144 kg of straw. In other words, a typical sugarcane harvest in Brazil will generate at least 90 million tonnes of straw. Approximately 50 % of all this 'waste' has massive fuel potential. Ethanol fuel production could significantly increase without using more land — a particularly sensitive issue. And Europe's demand for ethanol is on the rise.

Already, Europe imported some 10 Mhl of ethanol in 2009, up from 3 Mhl in 2004. It is hoped that, by 2020, at least 10 % of all fuel used in Europe will come from renewable sources, including ethanol. And according to the European Commission, biofuel must

emit at least 35 % less greenhouse gases than the fuel they replace. Within that formula is a carbon footprint that must be taken into consideration.

### More and better knowledge

But to get there, more knowledge and research is required. For instance, knowledge gaps remain in understanding the dynamics between pre-treating and hydrolysing lignocellulosic biomass. Pre-treating involves opening the lignocellulosic fibre structure. It exposes the cellulose and hemi-cellulose in bagasse and the sugarcane straw for enzymatic hydrolysis. Hydrolysis, on the other hand, introduces a catalyst that releases the fermentable sugars from the more complex carbohydrates. But for second-generation biofuel to become a reality, researchers will first have to identify which part of sugarcane biomass is the most susceptible for an enzyme-based conversion technology to produce the fuel. They must also evaluate the best pre-treatment conditions to help reduce the final cost to the consumer.

'In order to develop the Canebiofuel process, deeper knowledge about the structural components of biomass will be required with the aim of capturing the most convertible fraction of the cellulose sugars,' write the researchers.

To build this knowledge, Canebiofuel researchers had to collect samples. In April 2009, they set out into a sugarcane field along with around 40 people from the São Martinho mill in Brazil. A few hours later, they returned with several



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hundred tonnes of sugarcane and straw and extracted an optimal amount of bagasse for the project's experiments.

Researchers then separated the straw into its individual parts and measured its moisture content and impurities. They then vacuum-packed the bagasse samples for evaluation at labs in Curitiba and Piracicaba. At the labs, the researchers were able to analyse the biomass fractions in relation to their chemical compositions using chromatographic and spectrometric methods. They looked at both the freshly harvested straw and the bagasse they had collected inside the mill. The researchers then classified the chemical and morphological differences between the bagasse and the cane straw.

### The enzyme cocktail

Getting bioethanol from lignocellulosic materials is not a new concept. Cellulolytic enzymes have for years been used to convert materials into the fuel. The challenge stems from the quality of pre-treated fibres and high production costs. A trade-off between

pre-treatment and enzyme hydrolysis needs to be identified to help cut overall production cost.

Canebiofuel has been able to narrow down the best-performing enzyme cocktails. They pre-treated the bagasse and cane straw using steam explosions under catalysed and auto-hydrolysis conditions. They were then able to identify a high-performing combination of enzymes and pre-treatment conditions. Researchers are now in the process of refining the enzyme pre-treatment synergy in order to provide optimised process yields.

'The latest enzyme technology from Novozymes Cellic CTEC2, combined with the Canebiofuel pre-treated materials, is giving us the best results. This indicates that the enzyme solution under development at Novozymes is on the right track, also when it comes to enzymatic hydrolysis of sugarcane bagasse and straw pre-treated by steam explosion in combination with using phosphoric acid as catalyst,' says Mr Knudsen.

Finding alternative sources of energy is vital for Europe. As the demand increases, so does the pressure to create better-performing, greener and more energy efficient vehicles. Whether it is for transport or heating the home, second-generation biofuels are a promising alternative to fossil fuels. And should Canebiofuel produce the world's first cost-effective and commercially viable process for converting sugarcane biomass into fermentable sugars, then Europe's goal of becoming a more energy and resource efficient 2020 will become all the more attainable.

The Canebiofuel project is funded by the EU's Seventh Framework Programme (FP7) for research.

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## Plant powered — fuel cell energy from living plants

*The EU-funded Plantpower <sup>(1)</sup> project is developing a fuel cell containing living plants and bacteria that can convert solar energy into electricity or hydrogen in a clean and efficient way.*



A plant microbial fuel cell (Plant-MFC) is potentially five times more efficient than conventional bioenergy systems. The device produces molecules of low molecular weight that can be efficiently transformed into useful energy carriers.

Furthermore, no combustion or additional greenhouse gases such as nitrogen or sulphur oxides are produced during energy production. Another advantage is that the device can be implemented in semi-natural environments such as recreation grounds, rice-fields and wetlands.

This innovative technology creates minimal environmental disturbance and does not compete with agricultural land, which is required for food production.

In addition plant nutrients are retained, enabling the two activities of food and energy production to be combined.

Use of Plant-MFCs can help reduce pollution and high food and energy prices. The technology requires no harvesting or transport of biomass as the bioenergy is produced in-situ. The result is a negligible input from expensive, greenhouse gas emitting fossil fuels.

Plantpower can improve the quality of life for European citizens through reduced pollution and greenhouse gas emissions and help safeguard agricultural land for food production. The success of Plantpower will also help the EU to remain a global leader in the race to develop new forms of renewable energy.

(1) 'Living plants in microbial fuel cells for clean, renewable, sustainable, efficient, in-situ bioenergy production.'

Funded under the FP7 specific programme Cooperation under the theme Energy.  
<http://cordis.europa.eu/marketplace> > search > offers > 6057



## Eco-fuel to make aeroplanes fly green

*The search to identify and develop environmentally friendly fuels is meeting with success as new options are being tested for aeroplanes.*

As the price of fuel oil continues to fluctuate and climate change becomes a pressing challenge, there is a growing need to develop more eco-friendly ways for aeroplanes to fly. The 'Alternative fuels and biofuels for aircraft development' (Alfa-Bird) project, funded by the EU, is working on developing alternative fuels for planes, taking civil aviation towards more sustainable growth.

Coming up with biofuels and alternative fuels in aeronautics is a great challenge since the operational

constraints — such as flying in very cold conditions — are very strict. The long lifetime of current civil aircraft — almost 50 years — also challenges the use of newer, greener fuels. To address this, Alfa-Bird is gathering industrial partners from the aviation and fuel industries, along with experts in aeronautics, biochemistry, combustion and industrial safety. This approach involves the study of alternative fuels, chemical analyses, new injection and combustion systems, compatibility with aircraft systems and the actual production of new fuels.

options include paraffinic fuels based on hydro-treated vegetable oils and synthetic fuels. Another middle-term possibility is based on naphthenic fuels, representing new production processes such as coal or biomass liquefaction. Oxygenated fuels, such as higher alcohols or furanic compounds, fall into the long-term category.

More tests will be undertaken on fuel blends and the engines. Data collected during these tests will be used to prepare the environmental and economical impact assessment which will help develop the future strategy for alternative fuels in aircraft. Alfa-Bird is also collaborating with several other European and international projects in compatible fields to help realise its goals.

Ultimately, the impact of such a project will be of prime importance for the evolution of aviation over the next five decades. Our skies may well become cleaner, as Europe helps set the standard for better and greener aircraft fuel.

Funded under the FP7 specific programme Cooperation  
under the theme Transport.

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Based on a first selection of the most relevant alternative fuels, a detailed analysis of up to five new fuels has already been performed with tests under real conditions. The first fuel selection matrix has been designed around three main axes, covering a wide range of possible alternative fuels for both short- and long-term applications. The short- and middle-term



## Blast off for green space propulsion

*A European research project is developing environment-friendly propellants as an alternative to the highly toxic and carcinogenic materials currently used in space propulsion.*

Space exploration can play an important role in developing European competitiveness through scientific progress and a knowledge-based society. So-called green propellants can help reduce harmful effects to operators and contamination of the

environment, thereby significantly reducing handling costs.

The EU-funded 'Green advanced space propulsion' (GRASP) project set out to develop more environmentally sound alternatives. Project partners initially suggested 92 candidate green propellants, before whittling it down to 27 on the basis of toxicity, performance, storability and technology readiness level (TRL). These environment-friendly propellants are less toxic, have similar performance levels and are suitable for storage. They also possess the required TRL levels compared to the

more toxic conventional propellants that are used as a reference.

A number of the 27 propellants are being tested in order to derive more data for further selection. Project partners have prepared test facilities, propellants and catalysts for the next round of analysis. Analytical and numerical tools are currently being developed to help scientists better understand the decomposition process and help in the design of the thrusters and its components.

The GRASP project will help to reduce costs and exposure to toxic and carcinogenic substances and improve performance and ensure the competitiveness of European industry in a dynamic market.

Funded under the FP7 specific programme Cooperation  
under the theme Space.

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## Storing carbon in coastal flood deposits

*An EU initiative has investigated ways of capturing excess carbon dioxide (CO<sub>2</sub>) from the atmosphere and storing it in the sediments of river deltas in a process known as carbon sequestration.*

The Somflood <sup>(1)</sup> project has examined river-dominated ocean margins (Riomar) as part of their studies into sediments. One of the most important and least understood features of Riomar is their highly dynamic nature. Information is lacking regarding the role that events such as floods play in

the biology, chemistry and geology of organic matter in these environments.

Scientists have overcome this gap in their knowledge by studying organic matter in sediments. The sediments sampled were laid down during a once-in-a-100-year flood and were collected from the mouth of the Po river. Project partners have also carried out a series of analyses to test a computer model of the cycling of organic matter in Riomar.

Tests have been conducted on the effect of sediment deposition and microbial activity on the processes behind the cycling and ultimate fate of

organic material in the flood deposit. Researchers have also studied changes in the physical properties and composition of organic matter including organic nitrogen and organic carbon and biomarkers such as amino acid products.

Work conducted by the Somflood project will give scientists a better understanding of the suitability of Riomar sediments for the sequestration of carbon dioxide. This reflects the EU's commitment to fighting climate change by reducing CO<sub>2</sub> emissions to the atmosphere.



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(1) 'Compositional changes of sedimentary organic matter from a 100-year flood deposit: insights into event-driven processes in the coastal ocean'.

Funded under the FP7 specific programme People (Marie-Curie actions).

<http://cordis.europa.eu/marketplace> > search > offers > 6111

## Making an impact with high-tech accident prevention

*There are many ways to prevent or minimise accidents. One way is to understand the consequences of impact and strain on structural materials. The transport sector and industry in general are set to benefit significantly from such an endeavour.*

In the complex, fast-paced world of vehicles, road infrastructures and heavy industry, accidents of all sorts, such as collisions or crashes are bound to happen. Today's sophisticated imaging

technology can help understand the exact impact of any such accident. It's an important step in developing better materials and designing improved processes to help avoid accidents.

The EU-funded Advise <sup>(1)</sup> project aims to accurately measure strain and deformation (breaking, bending, etc.) in live simulations. This will allow industry and product or process designers to pre-empt accidents through better understanding, an initiative that is particularly useful in the transportation sector.

Advances in optical techniques for measuring deformation have been combined with recent ones in modelling the impact of two- and three-dimensional composite structures. Composites are tough hybrid materials that are meant to withstand strain. On the basis of this, Advise is planning to deliver recommendations on improving image-based methods of deformation measurement and to propose better ways for optical measurement and computational modelling. The project aims to draft standards for the experimental validation of accident simulations.

While best practice guides exist for numerical modelling and static measurements of stress and strain, there are no international standards for analysing data from dynamic



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experiments. This approach is necessary to validate numerical results in stress, vibration and impact response, i.e. to correlate finite element results with experimental observations.

The Advise team includes experts from research laboratories, universities, instrument suppliers, and companies from the aerospace and

automotive industry. Such a multifaceted group will be able to shed light on different aspects of measuring deformation and strain accurately.

Once Advise completes its mandate, it will disseminate standardised procedures that allow safety levels to be defined in a much more accurate way. The information has strong potential

in raising safety standards and saving lives, particularly in transport and industry.

(1) 'Advanced dynamic validations using integrated simulation and experimentation'.

Funded under the FP7 specific programme Cooperation under the theme Transport.

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## On track to better train signalling

*An EU-wide initiative will finally standardise the different train signalling systems, allow them to communicate with each other, reduce costs and increase rail safety and efficiency.*

Rail systems across Europe are quite different from one another, and their signalling systems have, for the most part, evolved independently. The EU has been promoting reform for parts of the signalling technology under the European Rail Traffic Management System (ERTMS). Yet even today, some systems are much older and much less advanced than others, and legislation reforms do not cover all components of these systems.

The European Train Control System (ETCS) is a signalling, control and

train protection system designed to replace older safety systems across Europe. These systems are often incompatible. For this to succeed, rail interlocking systems need to be replaced in many parts of the continent. Interlocking is the mechanism that controls trains at junctions, at crossed tracks or at draw bridges, for example. Railways are aiming at significantly reducing costs of future interlocking systems: standardisation, quicker installation and better equipment are key requirements in this respect.

One of the main aims of the EU-funded 'Integrated European signalling system' (INESS) project is to improve standardisation of interlocking and signalling technologies in line with current European policies. Another is to encourage industries more directly involved in managing infrastructure to develop innovative solutions for the future. However, upgrading and integrating the systems could be hampered by the lack of overall standardisation in the signalling layer.

To deal with this, INESS is harmonising future interlocking specifications with the current ERTMS ones and filling any specifications gaps along the way. Furthermore, reliability, availability, maintenance and safety of the future interlocking system as a whole are being addressed. An engineering approach in accordance with the European Committee for Electrotechnical Standardisation (Cenelec) is also being incorporated to comply with ETCS at all levels.

Once the different sub-projects are completed, better train signalling and safer, more efficient train journeys are the likely and desired result. INESS will also allow train equipment and technology suppliers to strive for one standard, making the industry more competitive and profitable.

Funded under the FP7 specific programme Cooperation under the theme Transport.

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## EU-funded study discovers link between climate and ancient societies

*An international research team has found new evidence of how the climate affected ancient societies. The study, published in the journal Science, reveals how periods of climatic instability often coincided with turbulent times in European history.*

The study was funded in part by Millennium<sup>(1)</sup> and ACQWA<sup>(2)</sup>, two projects supported under the EU's Sixth and Seventh Framework Programmes (FP6 and FP7) respectively. Millennium received more than EUR 12 million from the 'Sustainable development, global change and ecosystems' thematic area of FP6, while ACQWA received almost EUR 6.5 million from FP7's Environment theme.

Led by the Institute for Forest Growth at the University of Freiburg in Germany and the Swiss Federal Research Institute (WSL), the team was made up of climatologists, geographers, archaeologists and historians. By assessing ancient tree rings from more than 7 000 sub-fossil, historical and living tree samples, they were able to reconstruct the history of central Europe's summer temperature and precipitation over the last 2 500 years, rather than the 1 500 years generally used in past studies.

The team then compared variations in European summer climate with human historical events and episodes such as plagues, migrations and the Thirty Years War. Their conclusions shed new light on how climate change played a crucial role in agrarian wealth and economic growth.

'Climate variations have influenced the agricultural productivity, health risk and conflict level of preindustrial societies,' the authors of the study write. 'Discrimination between environmental and anthropogenic impacts on past civilisations, however, remains difficult because of the paucity of high-resolution palaeoclimatic evidence. Here we present tree ring-based reconstructions of central

European summer precipitation and temperature variability over the past 2 500 years. Recent warming is unprecedented, but modern hydroclimatic variations may have at times been exceeded in magnitude and duration.'

The researchers point out that the climate data stored within the trees enabled them to compare natural precipitation and temperature fluctuations with the development of European societies. They found that Europe's summer climate during the Roman era, for instance, was relatively warm and wet, and changed little. Increased climate variations from around 250 to 600 AD, say the researchers, coincided with the fall of the western Roman Empire. It also coincided with the havoc of the migration period when Europe's population underwent major restructuring.

'Wet and warm summers occurred during periods of Roman and medieval prosperity,' the authors write. 'Increased climate variability from around 250 to 600 AD coincided with the demise of the Western Roman Empire and the turmoil of the migration period. Historical circumstances may challenge recent political and fiscal reluctance to mitigate projected climate change,' they add.

Furthermore, they found that humid and mild summers paralleled the fast political and cultural growth of medieval Europe. They also found that a poor climate could have influenced the health conditions that played a part in triggering the economic crisis that emerged during the Black Death plague pandemic in the 14th century.

The researchers note that the temperature minima in the early 17th and 19th centuries coincided with both the settlement abandonment during the Thirty Years' War and the mass migration of many Europeans to America.

The team advises that the projected global climate change may have a much more significant impact on human societies than what researchers currently believe. Moreover, complex causal links between past climate changes and human responses need further research, they say.



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(1) 'European climate of the last millennium'.

(2) 'Assessment of climatic change and impacts on the quantity and quality of water'.



## Water policy reflects changing climate

*The European Union must address the effect of climate change and how its impacts can be mitigated through policies for water use. The EU-funded Climatewater <sup>(1)</sup> project will help decision makers to make the best choices.*

Climatewater is identifying strategies to reduce the effect of climate change on water resources and the aquatic environment. The project is also developing a framework for conserving water resources that are used both by society and in nature.

Major impacts of climate change include flooding, drought and water scarcity, which can also cause deterioration in water quality. Flash floods can result in an increase in heavy metals and pathogens in the water supply. The effect of climate change on natural systems such as forests must also be addressed in order to preserve these key habitats and the biodiversity they contain.

Changes due to climate change can also include more extreme weather events, rising sea levels and increased storm surges.

Changes in water levels will have serious consequences for river navigation and hydropower. The nuclear power industry also requires large amounts of water for cooling purposes.

The consortium contains partners with both scientific and policy experience that can identify research needs and gaps in water related policies that might hinder the EU's response to climate change. The Climatewater project will therefore play a key role in preparing European institutions, industry and infrastructure for the challenges that lie ahead.

(1) 'Bridging the gap between adaptation strategies of climate change impacts and European water policies'.

Funded under the FP7 specific programme Cooperation under the theme Environment.

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## Protecting highland aquatic resources in Asia

*The rich lake and river ecosystems found in the Asian highlands have supported local communities for generations. A novel collaboration between experts in Europe and Asia aims to make sure these resources are preserved for future generations.*

Fishing is an important livelihood in these regions, but can often lead to unsustainable exploitation of local natural resources. The EU-funded Higharcs <sup>(1)</sup> project put together an interdisciplinary team from several European and Asian research institutes to address this challenge.

The first task has been to evaluate the current status of these ecosystems.

To this end the species information system (SIS) tool, developed by a member of the Higharcs team, is helping identify which species, mainly fish, are possibly endangered and require more aggressive protection measures. This information is also being shared with the global database Fishbase.

Working with local communities is critical if Higharcs is to be successful.

Important feedback has already been gathered that highlights considerable variation in the way in which different user groups value the highland aquatic resources. Focus groups are helping to raise awareness on the ground about the fragility of these ecosystems and to encourage communication among the various stakeholders.

The goal of Higharcs is to develop policy initiatives that will balance environmental concerns regarding biodiversity and sustainability against economic issues such as employment. Special attention is being paid to the aspects of age and gender during the formation of these action plans. Extension of the international collaboration beyond Higharcs is also foreseen.

(1) 'Highland aquatic resources conservation and sustainable development'.

Funded under the FP7 specific programme Cooperation under the theme Environment.

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## Preserving cold-water corals in the deep ocean

*The ocean depths may seem a long way down but the unique species and ecosystems they contain are under serious threat from destructive fishing practices. A European project has investigated the relationship between deep-sea corals, fish and fisheries to develop tools that support ecosystem-based management of deep ocean habitats.*

Cold-water corals are found in the deeper, darker parts of the sea down to a depth of over 2 000 metres, where the water temperature may be as low as 4 °C. Coral habitats and the fish life that they sustain are facing threats from deepwater trawling which breaks corals apart and destroys reefs.

Help is at hand in the form of the EU-funded Coralfish <sup>(1)</sup> project. The initiative supports an ecosystem-based management approach for the deep sea and complies with UN General Assembly resolution 61/105. The resolution calls upon fisheries management organisations around the world to assess the impact of seafloor fishing on vulnerable marine ecosystems.

Marine scientists from the Coralfish consortium have identified and mapped vulnerable ecosystems using state-of-the-art methods of data collection. Project partners evaluated the distribution

of deepwater seafloor fishing activities in relation to coral habitats in order to identify areas of potential interaction and negative impact.

Researchers have also identified commercial fish species living off reefs and incorporated fish into coral ecosystem models to achieve a better understanding of the habitats fish-carrying capacity. Bioeconomic models have been developed to assess different ecosystem management options for protecting the coral habitat, including the use of marine reserves.

The Coralfish project will make a valuable contribution to understanding the relationship between cold-water corals, fish and fisheries in European waters and perhaps beyond. The initiative has provided scientists and policy-makers with tools for determining more accurately the ecological status of these fragile ecosystems and the impact of



commercial fishing. This valuable information will enable important conservation areas to be better protected, which helps to preserve biodiversity in our seas.

(1) 'Assessment of the interaction between corals, fish and fisheries, in order to develop monitoring and predictive modelling tools for ecosystem based management'.

Funded under the FP7 specific programme Cooperation under the theme Environment.

<http://cordis.europa.eu/marketplace> > search > offers > 5936

## Where hunting meets sustainability

*Research at hunting sites spread throughout Africa and Europe is driving the development of new policy concepts aimed at preserving and promoting biodiversity.*

Hunting is an age-old human activity. Today, many people enjoying hunting as a sporting pastime, yet it remains a livelihood for many others. Whatever the motive, the effect of hunting on the biodiversity of ecosystems in which it takes place is not well understood.

The aptly named 'Hunting for sustainability' (HUNT) project, which received financial support from the EU, is examining this issue in several different parts of Africa and Europe. This unique collaboration between African and European researchers is investigating the connection between attitudes toward hunting, the activity itself and its ecological impact.

Detailed profiles describing the species hunted as well as the local cultural norms are being created for each region. The varying objectives of hunters and the ways in which they are regulated

are also being studied. Finally, data is being collected from the ecosystems and used to calibrate models addressing biodiversity and sustainability.

An important step that HUNT is taking is the engagement of the full range of stakeholders. For example, questionnaires are being used to gather feedback concerning the monetary value assigned to biodiversity and who should pay to help preserve it.

Finally, in addition to fostering international cooperation on this subject, HUNT is also looking to contribute to the development of new hunting policies that target sustainability. Additional information can be found online (<http://fp7hunt.net>).

Funded under the FP7 specific programme Cooperation under the theme Environment.

<http://cordis.europa.eu/marketplace> > search > offers > 6049



## Tagging the eel

*European eels are becoming an increasingly endangered species as stock steeply decline. Wild stocks are currently half of what they were a few years ago. The European research project Eeliad <sup>(1)</sup> aims to resolve some of the mysteries by analysing the eel's biology and thus using this information to help conserve European eel stocks.*

Eeliad is researching European eels during their marine migration. Currently, very little is known about the life and spawning success of silver eels once they escape to the sea. Researchers are working on a large-scale field. This will help them determine migration routes and behaviour of silver eels and in addition, determine ecological factors that influence the number and quality of silver eels.

The team only tag right-sized specimens of eels. They are then measured, weighed and have their bones analysed. The coordinator of Eeliad project, David Righton, found that eels move from cooler water during the day to warmer water during the night. Furthermore, eels choose to swim in darker areas and make sharper vertical movements.

These newly identified migration patterns could point scientists towards different outcomes about eels' parasites and diseases.

Biologists also study tags from other research projects. These tags provide further information on eel's behaviour. Tags from Spain, Ireland and Sweden have already confirmed that eels can travel up to 45 km per day and swim as deep as 1 200 metres.

The knowledge gained from the Eeliad project will be of direct use to the conservation of eel stocks by improving and changing the way eel fisheries and habitats are managed across Europe. It will additionally ensure that enough silver eels migrate to their spawning grounds to reproduce and sustain their species.

(1) 'European eels in the Atlantic: assessment of their decline'.

Promoted through the Research Information Centre.

<http://ec.europa.eu/research/infocentre> > search > 19573



## A sustainable future for fishing

*The ever-increasing demand for fish has placed a huge amount of pressure on world supplies. But while there is an acceptance that action is needed to ensure the continued viability of aquatic ecosystems, there is also a growing understanding that the first step of effective conservation is better fish stock identification and monitoring.*

The UN's Food and Agriculture Organisation (FAO) estimates that 80 % of marine fish stocks are fully or overexploited worldwide. Illegal and unregulated fishing contributes significantly to this situation, and pose a severe threat to marine ecosystems. Control and enforcement of fishing regulations is often hampered by difficulties in identifying the geographic origin of fish and fish products, at point of landing and further down the food supply chain. And while forensic genetic species identification methods are routinely employed to investigate commercial fraud, there are at present no fully validated methods for identifying the geographic origin or population of marine fish.

'It is generally recognised that [fish] populations are the natural unit of evolutionary change, and it is therefore at the level of populations that genetic and ecological diversity should be described for conservation measures,' says Professor Gary Carvalho, coordinator of the 'Fish population structure and traceability' (Fishpoptrace) consortium, an EU-funded project directed at the development of forensically validated tools to trace individual fish back to source populations. In addition, the professor points out that it is at the population level that policy legislation and associated enforcement must take place, and that there is an increasing requirement for traceability of fish and fish products, both for consumer protection and for regulatory enforcement, in particular

with respect to illegal, unreported and unregulated fishing.

Tracing fish populations however is not as easy as it sounds. Migratory behaviour, inhospitable habitats and unforeseen factors such as pollution mean that accurate tracking is anything but straightforward. Many projects have drawn on various techniques, from genetics and genomics to physiology and microchemistry of fish ear bones, to find the best means of tracking fish stocks. These studies have produced a great wealth of data, which could serve as the basis for further research. One issue however is that, up until now, such research projects have been fragmented and often isolated, which has resulted in the dispersal and eventual loss of generated data.

### Fishing for answers

The EUR 3.9 million Fishpoptrace project, which was launched in 2008, is devoting three years to finding the best possible means of accurately recording the distribution of fish stocks.







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It is the first major programme focused on the population level. The project has, nonetheless, been building on previous EU studies, such as Fish and Chips, which developed three DNA chips for identifying and monitoring relevant species using suitable molecular markers. Another project, Fishtrace, went further by compiling molecular, biological and socio-economic data for a standardised genetic catalogue of European marine fish, and developing an online database for storage and public access.

Fishpoptrace is building on these and other studies in order to generate forensically validated panels of single nucleotide polymorphism (SNP) markers for geographic origin assignment in four commercially important fish species: cod, hake, herring and common sole. The project will then integrate these data to generate a single compatible database and tissue archive, which would be managed by the Joint Research Centre of the European Commission. Traceability tools will also be tested and validated. Finally, a population monitoring system based on genetic and otolith data capable of assessing population stability will be developed. Otoliths — bony structures in the inner ears — give an idea of growth conditions through the fish's life and can tell its age in days.

'Fishpoptrace will thereby contribute to efficient fishing activities within an economically viable and competitive fisheries industry, and hence contribute to the Common Fisheries Policy's aim of providing a fair standard of living for those who depend on fishing activities as well as taking into account the interests of consumers,' says Prof. Carvalho.

### Chips for fish

The project partners have already made progress. A database crawler has been used to identify and organise information in other relevant databases, while a common platform for archived tissues has been established. Furthermore, standardised sampling protocols have been completed, along with the actual collection of samples. Access to these samples has also been made available, and sample distribution to project partners is close to completion. Complete tissue archives and sample data are now available to all participants via the project website.

The successful sequencing of samples has also been carried out, with the development of one SNP chip for each of three species: sole, hake, and herring (Canadian researchers have already created an SNP chip for cod, extended here for use in European populations). These DNA-covered microchip-like devices, which can test the identity of up

to 1 536 possible SNPs for each species, have also proved to be highly effective. For example, the project partners used the cod SNP chip to examine, without knowing the source, samples from the Atlantic and the Baltic. By looking at 20 SNPs, the researchers correctly identified every sample origin. The sole SNP chip was also successfully used to differentiate between North Sea sole and Mediterranean sole. The Fishpoptrace team also demonstrated that just 10 SNPs could reveal the origin of hake with near-perfect accuracy.

The Fishpoptrace project is also delivering a publicly accessible database, incorporating data from

all the tools developed from the project as well as a comprehensive summary of available tissue samples for target species. 'The aim is to continue the Fishpoptrace database beyond the lifetime of the project, so that it will not only form the basis of a working platform for the fisheries community, but importantly will allow further enhancement,' says Prof. Carvalho.

In this way, the Fishpoptrace project will make a valuable contribution to the fight against illegal and unregulated fishing, and will give marine scientists a clearer idea of the conservation and fisheries management measures needed. If the enforcement of penalties against illegal and unregulated fishing is to be effectively implemented, then accurate population monitoring systems must be put in place. It is all too evident that effective measures to counteract the alarming state of many fish populations are of the highest priority.

Coordinated by Bangor University in the UK, Fishpoptrace is a collaborative project involving 15 research groups from the EU, Norway and Russia, who specialise in fish population genetics, molecular biology, proteomics, microchemistry and biochemistry.

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## Better agriculture for a new Europe

*The EU is helping newer European states optimise agriculture. Key country reports are focusing on financial support, renewable energy, animal welfare and overcoming obstacles.*

Agriculture and farming are the backbone of society and the economy. We depend on safe, healthy crops and animals to invigorate our economy, boost trade and put food on the table. The sector's policies are always being shaped to guarantee the interests of both society and economy. There has been a need to refine these policies for the more recent EU Member States or upcoming members, specifically those in central and eastern Europe.



An EU-support action titled 'Enlargement network for agripolicy analysis' (Agripolicy) has studied the agricultural and rural sectors in these regions. It supported the application of EU agricultural policies by sharing information and strengthening policy formulation in

25 concerned countries. From Cyprus and Slovenia to Albania and Croatia, the EU has worked vigorously to shape agricultural policy-making in and around the continent.

The project's accomplishments began with a collection of agriculture-based statistics in these nations and preparation of a report with key results. The Agripolicy team analysed agriculture and agricultural policy for eight candidate and potential candidate countries, including Kosovo, Montenegro, Serbia and Turkey. It then created detailed country reports that would help policy-makers and stakeholders streamline and upgrade agricultural policy, harmonising it with the rest of the EU.

Various reports have been written for different sectors and topics. A revealing report on dairy, for example, describes the sector and estimates performance for all 20 countries. Each report provides insights into the sector's competitiveness, identifies key constraints to competitiveness and suggests key policy interventions.

Another series of reports on renewable energy and its impact on rural development discusses relevance and potential of renewable energy for rural communities in 20 countries. Each report provides an overview of the use of renewable energies, a review of national policy and insights on its impact on the agricultural sector.

One important report emerging from Agripolicy has centred on the impact of direct payments. Support for agriculture within the EU is mainly based on the concept of direct payments to farmers. These payments were introduced as partial compensation for price cuts for certain products. The payments represent financial compensation for the high standards of environmental protection, animal welfare and consumer protection in the EU compared to the production requirements in non-EU countries. This report investigates the impact of the current direct payment systems and provides insights into possible effects of different options for future direct payments.

The results of the project have been presented at a workshop organised in May 2010. The findings of the study on direct payments will be used in future policymaking initiatives.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy'.

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See page 13 'Intercepting the hidden orders of genes for better crops'

## Combined organic insect repellent and fertilizer

*The EU-funded Ecobug<sup>(1)</sup> project supports organic growers by providing them with a combined smell-free insect repellent and fertiliser for cabbages and other vegetables. Project partners have created the Ecobug pellet, a sustainable, cost-effective solution to the problem of pest control that does not compromise the integrity of organic crops.*

Organic growers of vegetables such as cabbages, cauliflowers, broccoli and brussels sprouts face an implacable foe in the form of the cabbage root fly. The insects' larvae can cause serious damage to *brassica* crops by eating the

plants' roots. Fortunately, the Ecobug project has developed an organic form of pest control combined with an environment-friendly organic fertiliser.

The goal of the Ecobug project has been to develop the technologies required for the production of Ecobug pellets. The fertiliser element is made from manure and the insect repellent agent from blue-green algae grown in a fermentation reactor.

Supplying sufficient nutrients to growing plants is an additional challenge faced by producers of organic vegetables. Manure is often used but its application is labour intensive and is currently carried out separately from the application of organic insecticides.







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Manure has a significant environmental impact due to the emission of green house gases such as methane and carbon dioxide. Additional problems include smell and the contamination of surface waters following flooding.

Researchers identified a cost-effective smell free, solid-organic fertiliser made from manure and an organic insect repellent agent that can be applied together with the fertiliser. The aim was to develop all the technologies needed for producing a combined insect repellent/fertiliser product in pellet form. The insect-repellent activity and the fertiliser's effectiveness have been validated against living cabbage root flies in greenhouse trials.

Organic market gardeners will benefit from increased incomes as a result of higher yields. Livestock farmers will receive money for manure produced by their animals and a solution to the problem of disposing of agricultural waste. The Ecobug product can be designed to reflect the needs of selected crops by combining different ingredients. The aim of the consortium is to further develop the product and cover more pests.

(1) 'Development of an innovative industrial bioreacting and fermentation process producing an organic insect repellent-fertilizer for ecological farming.'

Funded under the FP6 specific programme

'Horizontal research activities involving SMEs.'

<http://cordis.europa.eu/marketplace> > search > offers > 5999

## Rethinking Europe's breadbasket

*Fine-tuning the genes of wheat, rye and barley will result in crops that resist disease and environmental threats.*

Staple foods made from wheat, barley and rye have formed an important part of our dietary needs for millennia. The more robust and hardy these crops are, the more food we will have to satisfy the needs of Europeans — and indeed the planet at large.

efficient resources have been developed that allow robust genomic programs to be established for the *Triticeae*.

The EU-funded project 'Genomics for *Triticeae* improvement' (Triticeaegenome) is designed to achieve significant genomic progress in these plants and support breeding of improved varieties for European agriculture. It aims to map the genetic characteristics which affect the resistance, yield and quality of *Triticeae*.

The project will support the development of new varieties that meet farmer and consumer needs through

molecular breeding. This will involve the development of new bioinformatic (computer-based) tools to structure and analyse the large-scale genomics data gathered within the project.

The project has succeeded in collecting relevant genetic data on barley, and the genome for these crops is being mapped meticulously. This also includes identification of key genes that can be 'tweaked' to produce desired

results. Genetic trials to produce better varieties are already underway in Germany, France and the UK. A comprehensive database of mapped genes and their traits has been developed, and genetic maps have been created using state-of-the-art technology.

Project achievements have been highlighted through brochures, lectures and international congresses covering 10 different countries, reaching as many as 30 000 people. Articles have also been published, and ongoing initiatives are taking place on a global level. To illustrate, the Triticeaegenome network now comprises 19 laboratories in various countries and twinning activities with the Wheatbiotech project in Argentina.

Overall, Triticeaegenome is expected to have several far-reaching results on the future of wheat, barley and rye. It has already established strategies and methods for improving genomics approaches and developing tools to accelerate gene isolation and molecular breeding. Project results are contributing to a better understanding of traits underlying crop yield, quality and disease resistance. It is strengthening collaboration on a global level and contributing to the transfer of know-how between research and industry.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy.'

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By understanding the genetic makeup of these grains researchers can develop new, more nutritious varieties that are more resistant to climatic change, crop diseases and manmade threats.

The genomics or genetic coding of these three crops — which belong in scientific terms to the group called *Triticeae* — has been a challenge to unravel due to their complexity. Recently, however, new technology and more



## Do forests hold the key to product sustainability?

*Pioneering research is demonstrating that sustainable, environmentally-friendly products can be created by combining wood fibre with plastics.*



Much of Europe is covered by forest. Raw materials derived from these abundant natural resources are, by nature, more sustainable than their mineral and hydrocarbon counterparts excavated from the below the Earth's surface.

The aim of the EU-funded project Forbioplast <sup>(1)</sup> is to develop new synthetic materials using forest products. The Forbioplast team includes experts in chemical engineering and materials science as well as industrial partners, underlining the intention to extend the results from the laboratory to the factory.

The first step has been to research and develop the methods necessary for combining wood fibres and paper processing by-products, such as tall oil, with

polymers. Polylactic acid and polyhydroxybutyrate are among the most successful so-called coupling technologies identified during Forbioplast.

Subsequently, a number of new products were developed with excellent structural properties. For example, wood fibres have been combined with recycled polypropylene to produce a vehicle bumper. Other innovative Forbioplast products target the packaging and agricultural industries.

The new products have been tested to ensure they were non-toxic as well as fully biodegradable. Possible savings in energy consumption and production costs are being evaluated through a full life cycle analysis.

(1) 'Forest resource sustainability through bio-based composite development'.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy'.  
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## Controlling the cost of care for older Europeans

*How is the elderly population in Europe being taken care of and how much is it costing? One initiative has mapped how care is administered and how it can be improved.*

As those born in the 1950s and 1960s (i.e. the baby boomers) age, there is an urgent need to address healthcare policy for the elderly. Increasing disability, obesity and survival rates are adding to the pressing needs of health care for the people reaching old age. The supply of labour is also affected by an ageing population in the EU, particularly if care is not readily available.

The EU-funded project 'Assessing needs for care in European nations' (Ancien) is reviewing long-term care (LTC) in EU Member States to assess the current and future needs of the elderly. It is considering technology and policies on maintaining and improving quality aspects throughout the EU.

The project has succeeded in describing the existing European LTC systems. It also produced a database covering most aspects of existing systems and a set of country reports.

The database was compiled from a comprehensive questionnaire covering all aspects of LTC. It provides comparable EU-wide data on LTC and identifies types of LTC systems. The country reports provide information on organisation, funding, demand and supply of formal and informal care, as well as LTC policy.



Currently, the project is estimating the effect of demographic and lifestyle factors on the need for care. It is also using new models to project future numbers of elderly persons by age, gender and severity of need.

Ancien is enabling a more accurate projection of disability rates, using risk factors such as age, gender, obesity and smoking. The model will be used to investigate the effects of changing demography and epidemiology (including health policies) on future care needs. In addition, the results and projections

will undoubtedly be very useful for researchers and policy advisors interested in the future developments of care needs in the EU.

Demand and supply of LTC are also being studied. It also compares formal and informal care within a European context. The potential impact of technology on LTC provision is being analysed for dementia, diabetes and obesity.

Lastly, the project is aiming to analyse LTC quality assurance by comparing quality indicators and policies.

It is establishing a set of indicators that will improve the future monitoring of LTC quality.

A survey has already been developed to gather data about policies for LTC quality assurance and standards. Combined, all these initiatives will boost health care for elderly Europeans.

Funded under the FP7 specific programme Cooperation under the theme Health.

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## How families pass on a sense of history

*Researchers have explored the passing on of family history from one generation to the next and the influence this knowledge has upon an individual's sense of identity.*

The aim of the 'Britons and their past' (BATP) project is to shed light on the way in which individuals connect to the past through their family history. According to research from Australia and the United States, the transmission of family history is the most trusted form of historical knowledge.

Project partners used a random sample from the list of voters from two parliamentary constituencies in the south-west of England to contact possible interviewees. The electorates were chosen for their different socio-economic profiles. One constituency was mostly rural while the other was in a working

class area of a large city. Twelve families ranging from four to two generations were identified and interviewed by BATP researchers.

Questions directed at the interviewees were concerned with different ways of passing family lore between generations. They included specific objects such as furniture, books and documents or key sites such as former residences or places of burial. Another way in which family history can be communicated was through oral tradition.

Stories about the past varied widely between families, but overall were used

more often than material objects to pass on a family's history. The exception was when the early death of a member left a gap in a families' collective memory. Stories tended to be optimistic and emphasised the positive, such as worthwhile character traits or important life lessons. Negative stories regarding past experiences acted as warnings or guides to behaviour.

Researchers have found that the intangible heritage within a family, such as its oral history is more important than previously believed, with the family acting as a lens through which the individual connects their own experiences with historical structures and events. The BATP initiative also reveals the role played by narratives in shaping the historical consciousness of individuals and the way in which they link the past with the present and future.



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The work of BATP was a pilot project for a larger survey of oral history and national consciousness. The findings from BATP can be used to help people engage more actively with their history than they have up till now, thereby helping to develop their sense of identity.

Funded under the FP7 specific programme People (Marie-Curie actions).

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## Enterprise logic gets an industry makeover

*European research helps industry to bridge the divide between what happens in the physical world and its representation in the digital world. The result is a collaborative process which marries wireless sensor technology with the emerging 'web of things' and sensors to make business and now industrial processes more accurate, reliable and cost-effective.*

With information and communication exchange as the core business of white collar workers worldwide, the office environment has spawned many IT innovations like distributed enterprise systems and internet-based applications and services. But with its complex and often critical systems, the manufacturing industry has been a late adopter.

Researchers saw an opportunity back in 2004 to combine business logic with the emerging internet of things — networked embedded systems wirelessly monitoring and sensing physical items. This marriage resulted in so-called 'Collaborative business items' (COBIS), smart entities like goods, equipment, parts and even shelves actively communicating with each other and a back-end system.

The central concept of the 30-month COBIS project was to manage business processes at the 'point of action' rather than as centralised systems. That way processes become more accurate, reliable, cost-effective and responsive to industry needs.

To achieve this, COBIS researchers used a common service paradigm throughout all layers, from the enterprise application down to the logic executed on sensor nodes.

Middleware was built based on service-oriented architecture (SOA) — flexible design principles used in systems development and integration — which allows the deployment of business logic in the form of services to the edge of the network. In other words, the system is better able to do whatever is needed without major intervention on the development side, which makes it a scalable and practical tool for fast-changing modern IT scenarios.

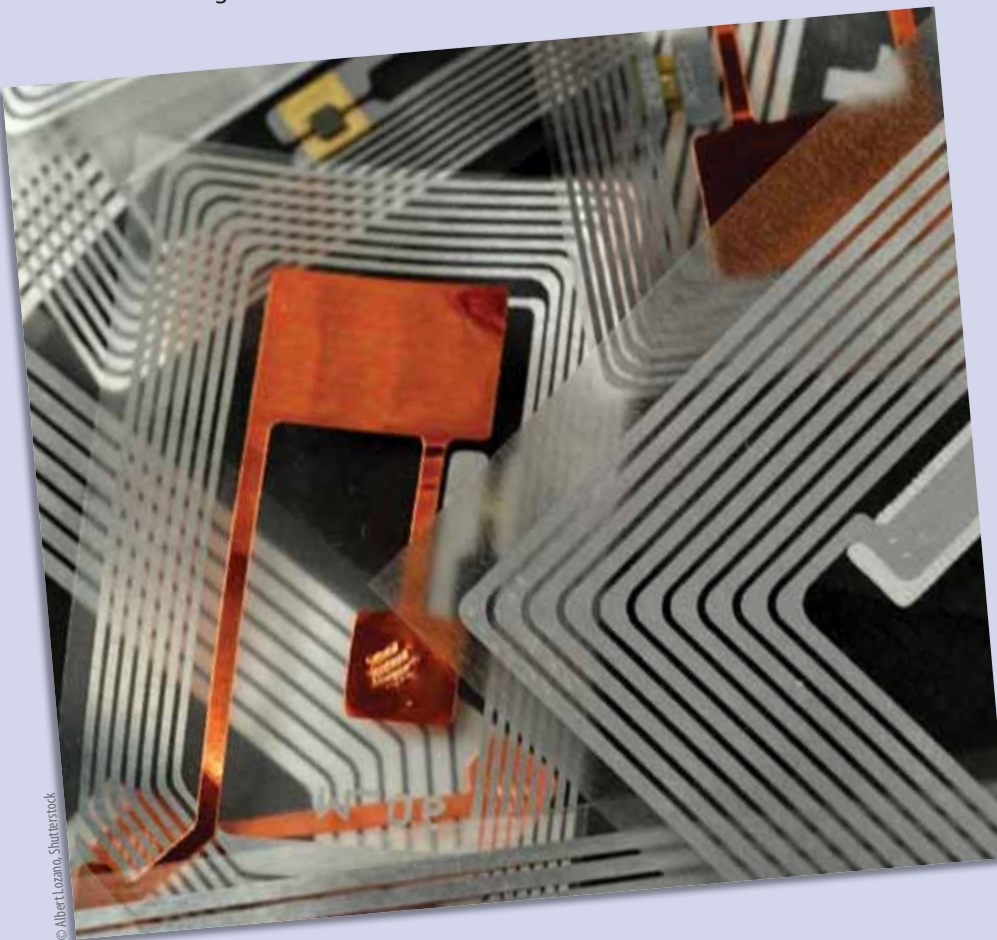
COBIS focused on providing the basic SOA framework as well as the tools to monitor and manage the network. Using a SOA in the context of distributed embedded devices, as well as sensor and actuator networks, solves several problems usually associated with such systems; namely the integration of sensors and actuators with enterprise systems as well as the management, monitoring and administration of a system with highly distributed logic.

'When we started the idea was a bit ahead of its time,' says COBIS project coordinator Stephan Haller, development architect at SAP Research in Switzerland. 'Now, the SOA approach is more common as we see the "web of things" becoming a reality.'

### Scenario revealed

Several application scenarios relevant to industry were identified and their real-world credentials were assessed in trials, including an automated system for monitoring chemical storage facilities and a smart shelf using radio frequency identification (RFID) technology in the clothing industry.

In addition to the SOA framework, a set of reusable collaborative services was defined and described in a newly developed service description language called COBIL. A COBIL service description includes a WSDL-based definition of the interface, a textual description of the service, as well as information about the composition of the service and technical constraints for its deployment.



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*'Working in EU-supported projects like this is an opportunity to sit down with the best academic researchers in the field and other companies in a pre-competitive setting.'*

Three different sensor network platforms, called Particles, Unodes and Sindrion, were integrated with the middle-ware through a common abstraction layer. The different platforms have different characteristics depending on the application scenario, according to the project.

'You just have to choose the most suitable technology for your needs,' says Mr Haller. 'And we even developed criteria that help end-users to make that choice, also comparing it to existing technology like RFID and wired sensors.'

On the layer of the sensor network itself, significant advancements were made. Improved energy efficiency, a reliable data dissemination protocol, and facilitated node programming help make the introduction of wireless sensor network technology to industrial applications much easier, explains the project coordinator.

### Time to percolate

The COBIS team knew from the outset that their work might take some time to percolate through to industry. So project partners TECO — Karlsruhe Institute of Technology (KIT) — and SAP Research created a spin-off, called Particle computer, to deliver customised solutions based on wireless sensor network technology.

The potential of the technology was demonstrated during one of the COBIS trials. Around 50 particles, which are smart tags that act as network nodes, were attached to drums containing chemicals in a BP refinery in Hull, UK. The nodes were programmed with information about the substance being stored and relevant regulations or rules regarding its safe handling, such as storage limits and proximities.

The scenario — two drums containing incompatible chemicals are mistakenly stored in the same depot or in the same

vicinity. COBIS technology detects this and sets off an alarm which alerts depot attendants that they have to move the offending drum and resolve the issue at the point of action. This incident is also reported in the back-end system.

Particle computer won several prizes for its groundbreaking technology, including an award by the German Federal Ministry of Economics and Technology as a flagship project from the High Tech Gründerfonds. The venture was later sold to a larger concern which no longer provides the particles. TECO, however, continues to use the platform developed as part of the project.

### Paying off

The COBIS project may have been ahead of its time commercially, but its efforts are still paying off. The research team extended the SOA concept to the device and entity level in real-world industrial settings. They managed to integrate wireless sensor network technology seamlessly with enterprise systems, and they made hardware and some lower-level software improvements to meet exacting real-world conditions in today's industrial settings. And they extended business process to the 'point of action', an avenue that is being further explored in the IOT-A ([www.iod-a.eu](http://www.iod-a.eu)) project, which includes COBIS partners.

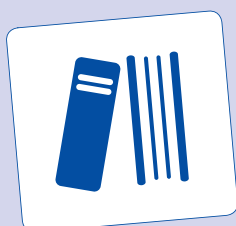
'COBIS was very interesting to work on — technology wise and in real-world applications like the BP trial,' notes Mr Haller. 'It has been quoted or referenced quite often since ending a couple of years ago, and I still get people asking about it,' he says.

'Working in EU-supported projects like this is an opportunity to sit down with the best academic researchers in the field and other companies in a pre-competitive setting,' suggests the SAP researcher. 'It puts people together who might not otherwise have the opportunity,' he concludes.

The COBIS project received some EUR 3 million (of a total EUR 4.7 million) in funding from the EU under the 'Information society technologies' (IST) scheme of the Sixth Framework Programme. COBIS final results and helpful audiovisual demos can be found on the project website ([www.cobis-online.de](http://www.cobis-online.de)).

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### Watch this space!

**Coming up in issue 3 of *research\*eu results* magazine a special dossier on 'Regions for research': a coherent research area for Europe!**

## New architecture for quantum computers

*A new architecture for quantum computation has emerged, according to a study published in Nature. Partial support for this study came from the EU-funded projects Microtrap <sup>(1)</sup> and SCALA <sup>(2)</sup>.*

Both Microtrap and SCALA were funded under the 'Information society technologies' (IST) thematic area of the Sixth Framework Programme (FP6) to the tune of EUR 1.77 million and EUR 9.36 million respectively.

Six years ago, scientists at the University of Innsbruck in Austria realised the first quantum byte — a quantum computer with eight entangled quantum particles.

This is a record that still stands, but 'nevertheless, to make practical use of a quantum computer that performs calculations, we need a lot more quantum bits,' commented Professor Rainer Blatt from the university's Institute for Experimental Physics. He, along with his research team, created the first quantum byte in an electromagnetic ion trap. But, as he explained 'in these traps we cannot string together large numbers of ions and control them simultaneously.'

To solve this problem, the scientists started to design a quantum computer based on a system of many small registers that must be linked. They developed a revolutionary approach based on a concept formulated by theoretical physicists Ignacio Cirac and Peter Zoller. They are both regarded as leaders in the areas of cold atoms, quantum

optics and quantum information. At the core of their research is the use of the microscopic world to build quantum computers and communication systems.

In their experiment, the physicists managed to electromagnetically couple two groups of ions over a distance of about 50 micrometres, where the motion of the particles serves as an antenna.

'The particles oscillate like electrons in the poles of a TV antenna and thereby generate an electromagnetic field,' Prof. Blatt explained. 'If one antenna is tuned to the other one, the receiving end picks up the signal of the sender, which results in coupling.'

The energy exchange that takes place in this process could be the basis for fundamental computing operations of a quantum computer, according to the team.

'We implemented this new concept in a very simple way,' Prof. Blatt pointed out. In a miniaturised ion trap a double-well potential was created, trapping the calcium ions. The two wells were separated by 54 micrometres. 'By applying a voltage to the electrodes of the ion trap, we were able to match the oscillation

frequencies of the ions,' he added. 'This resulted in a coupling process and an energy exchange, which can be used to transmit quantum information.'

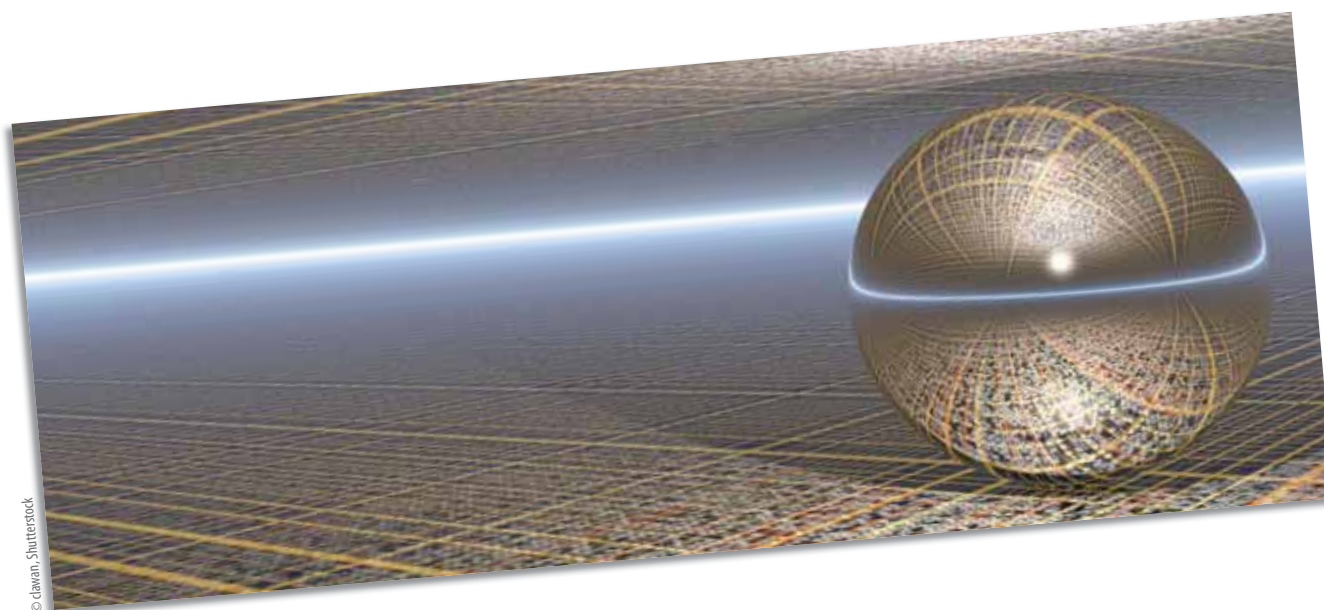
A direct coupling of two mechanical oscillations at the quantum level has never been demonstrated before. In addition, the scientists showed that the coupling is amplified by using more ions in each well. 'These additional ions function as antennae and increase the distance and speed of the transmission,' Prof. Blatt said. He expressed his excitement about the new concept, which constitutes a promising approach for building a fully functioning quantum computer.

'The new technology offers the possibility to distribute entanglement. At the same time, we are able to target each memory cell individually,' he said. The new quantum computer could be based on a chip with many micro traps, where ions communicate with each other through electromagnetic coupling. This approach represents an important step towards practical quantum technologies for information processing, concluded the team.

(1) 'Development of a pan-European microtrap technology capability for trapped ion quantum information science.'

(2) 'Scalable quantum computing with light and atoms.'

Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 20253



## Peer-to-peer to drive video multicasting

*Communications technology has evolved at a rapid pace. Today, we have gone beyond broadcasting and entered an era of multicasting. European researchers are doing the groundwork so peer-to-peer (P2P) networks can match the needs of users and providers in this growing phenomenon over the internet.*

Innovations in P2P communication have laid the groundwork for whole new ways of using the internet as a service. But the rapid evolution of P2P networks presents a problem for the so-called 'architects of the internet' — the people who develop the hardware, software, middleware and other bits and pieces that make it work.

important. It is also where the lines between traditional communications providers, operators, broadcast services, etc. get blurred.

Innovative business models are needed to embrace these changes, new middleware is needed to ensure QOS, and guidelines are needed to help the



How can quality of service (QOS) be maintained as more and more bandwidth is taken up by data-hungry video applications and services? Can P2P middleware which mediates the networks offer an innovative business model for the future internet? But then where will the telecoms operators fit in?

You can look at multicast service delivery as the natural evolution of communications which started as a one-to-one exercise (you talking to your neighbour over the fence or your sister over the phone). But thanks to technological advances, the opportunity of one-to-many communication (through the likes of radio and TV) is now evolving into a many-to-many paradigm through the internet. This is where peer-to-peer networks become

various actors settle on a workable and profitable future particularly for P2P-mediated video multicasting, which tends to hog bandwidth.

The European P2P-Provideo <sup>(1)</sup> project set out to provide technical guidelines that will implement P2P multicast transport services in an economical and profitable way, as well as scientific conclusions about the technical choices that warrant scalability and stability for P2P multicast applications.

On the technical side, the team has made good progress particularly on the video encoding work, reaching fine granularity scalability (FGS) for video transmission using an MPEG-4 FGS encoder developed by the project which can encode and decode video in

real time. The encoder has been implemented in Visual C++, an IT development environment, using Intel's integrated performance primitives (Intel IPP), software optimised for multimedia communications.

'Using the FGS as video encoding, a multipoint broadcast video transmission framework over a heterogeneous content distribution P2P network has been proposed,' note the project team. It is a live video broadcast platform where a video source distributes a video stream to a number of clients in a multipoint fashion. Multipoint communication has been achieved by applying a P2P approach, configuring a tree-structured overlay network (built on top of another network) where the root is the video source, while the other clients are internal nodes or so-called 'leaves', the researchers explain.

The project, which is due to end late 2011, has also developed a revenue model for their system putting users divided into two classes according to how they will pay for the service: with bandwidth (cheap-tariff peers), or with money (full-tariff peers). The model should help service providers design their networks to maximise their revenue while satisfying user requirements for top-quality video streaming.

'On one hand we expect to offer an effective platform for the management of user-provider relationships and for price negotiation of QOS broadband services,' note the project team. 'On the other hand, we will identify the most flexible architecture in terms of adaptive encoding techniques and adaptation logic satisfying the requirements of multicast video services.'

(1) 'P2P middleware for the deployment of an innovative business model for the provision of a QOS aware video multicast transport service over the internet.'

Funded under the FP7 specific programme People (Marie-Curie actions).

<http://cordis.europa.eu/marketplace> > search > offers > 6011



## The hunt for better land border security systems

*Europe's borders are long and notoriously difficult and expensive to patrol in the search for unlawful behaviour. But a European project is busy developing cheaper and better mobile patrolling solutions.*

The team behind the EU-funded TALOS <sup>(1)</sup> project is developing and testing flexible and adaptable unmanned patrolling solutions which are fit for purpose — to protect European borders efficiently and cost-effectively.

Conventional border protection systems are mainly based on costly ground observation and detection facilities installed along the length of a border, often complemented by human patrols where the terrain is accessible by land. Aerial and satellite monitoring are also part of the security mix.

TALOS is focusing on a cost-effective, scalable system using unmanned ground vehicles (UGVs) together with the communications and command and control capabilities required to run them. The ground platforms will

act as both watching stations and first-response patrols.

For example, the patrolling UGV sends information about an intruder to the ground station, which triggers the launch of another unmanned vehicle to intercept him or her. In the meantime, the command and control centre will send border guards to investigate the incident further.

First steps for TALOS project were to establish managerial procedures and build partnership with likely end-users, which informed the next steps of creating the technical requirements for the subsystems and the design of the general architecture and main components.

The team began work on the command centre and the UGVs, negotiated access to a demonstration site and applied for a radio frequency range for communications. By this stage, partners had also set up and populated an attractive website which acts as a platform for information exchange between the partners from across Europe and beyond, including Israel and Turkey.

Development of a virtual prototype of the UGV was

a necessary step before committing to manufacturing a real-demo vehicle. Progress on this has been steady and by mid-June 2010, the mechanical and electrical designs had been completed and the vehicles purchased. TALOS is modifying them ahead of the planned field trials.

In parallel, partners are further developing the low- and high-level vehicle control architecture and elements of the 'Unmanned units command centre' (Uucc), including the consoles for the commander and UGV operator, the emergency stop subsystem, simulators of the sensor tower and the UAV, as well as the terrain model generation station and communications subsystem.

It has not always been easy bringing together all the partners from different disciplines and countries and involving end-users. For example, various software components of the command and control subsystem and the vehicles themselves are being developed in different locations. The consortium's answer to this problem was to set up a dedicated VPN connection to verify the compatibility of deliveries at each stage of the project.

Patrolling Europe's vast borders is a huge challenge, and the TALOS project is leaving nothing to chance.

(1) 'Transportable autonomous patrol for land border surveillance'.

Funded under the FP7 specific programme Cooperation under the theme Security.

<http://cordis.europa.eu/marketplace> > search > offers > 5975



## On the look-out for security technology developments

*Security experts are likely to find it easier to keep up to date with the latest news from their sector, thanks to the work of European researchers. They have come up with technology to monitor developments in the security field and pass the information to the right people at the right time.*

The aim of the 'Security technology active watch' (STRAW) project, which recently ended, was to give European civil security a boost by facilitating co-operation between different groups,

namely researchers, technology providers and end-users.

The project's main outcome is a proof of concept for a tool to power what

the partners call a 'European security technology active watch.' This would monitor the security domain and detect relevant and applicable technology developments, knowledge, experience and stakeholders, and then deliver this information to people who are in a position to make use of it at that time.

The tool is supported by a technology watch portal, a semantic search engine and a wiki (Strawiki), which can be accessed by people who have registered on the project website.





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Another important outcome is a report summarising the project's findings and setting out recommendations for the future. Topics covered by the report include crisis management, ensuring law and order, border surveillance, and critical infrastructure protection. Among other things, the report points out that further work is needed to strengthen cross-border links between security stakeholders.

The report also calls for the creation of a European security network which could

identify and define common objectives for future security research. According to the report, this network should link together all the stakeholders involved in the security research domain, including European and national authorities, key decision-makers, scientific institutions, academia and the security industry.

Looking to the future, the project's sustainability plan paves the way for further joint activities.

Funded under the FP7 specific programme Cooperation under the theme Security.

<http://cordis.europa.eu/marketplace> > search > offers > 5976

## The hunt for more robust surveillance systems

*European scientists have set out to develop and integrate intelligent surveillance systems for monitoring both in and around critical public infrastructure. Their results should improve the reliability of current monitoring systems.*

What sets the EU-funded project apart is not just its name Samurai <sup>(1)</sup> but its plan to fuse information from networked heterogeneous sensors with CCTV cameras to create a more complete picture of a crowded public space. And through a series of innovations, including real-time scanning of unusual behaviour and the ability to accommodate changing situations on the ground

as well as data coming from mobile and stationary sources, the team believes their system will be more robust and timely and produce fewer false alarms.

Using standard systems, surveillance staff must pour over vast quantities of video recordings and data for signs of criminal/terrorist activity. Samurai's work should result in an online,

real-time monitoring tool that picks up abnormal behaviour which helps decision-makers respond to situations as they may develop. The savings in time, money and potentially lives stand to be significant with such a tool.

The three-year project, ending mid-2011, has already started collecting data from two sites. Valuable first data collection took place, for example, at Heathrow Airport's Terminal 3 in October 2009. A number of volunteers enacted scenes of abnormal or suspicious behaviour, including luggage theft, abandoning vehicles and unusual gatherings.

A functional design architecture diagram was finalised by the project partners which will provide vital information on the input and output of various technical task modules of the system and the interaction between them. And a prototype of the graphical user interface (GUI) for Samurai's online system has also been developed, along with the systems architecture and design.

The team is not wasting time in raising awareness of its important work to date with more than 20 papers already published or presented at leading conferences.

(1) 'Suspicious and abnormal behaviour monitoring using a network of cameras & sensors for situation awareness enhancement'.

Funded under the FP7 specific programme Cooperation under the theme Security.

<http://cordis.europa.eu/marketplace> > search > offers > 5970



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## A common vision of European security

*What threats will Europe face in the future? A research project has undertaken the first Europe-wide survey of security and strengthened networking of experts.*

Security policies have traditionally been looked at from a national viewpoint, producing a fragmented picture across Europe. A recently completed project has brought together experts from across the EU to assess whether a shared concept of security can be developed.

Funded under the EU's Seventh Framework Programme for Research (FP7), the project Foresec <sup>(1)</sup> was a

'foresight' exercise to assess current and longer term threats to European security. The first stage in the project, which began in February 2008, involved an in-depth analysis of existing work in this field. This produced 12 country reports and an overview of the global trends that influence European security.

Next a workshop was held to debate the findings with 80 experts in the

security field from across Europe. The results of this then fed into a Delphi survey on key security issues held between December 2008 and February 2009. This is a structured group interaction process involving rounds of opinion collection and feedback.

Over 300 experts were involved in the survey. They assessed possible factors and impacts on security up to 2025, looking at economic, political, environmental, technological and societal areas. The results of the survey were evaluated in a series of workshops in six different countries and a number of policy options were developed to prevent, mitigate and ultimately counter risks.

The project produced a detailed report of its findings and recommendations. It has also helped to create greater networking of security experts from across the EU.

(1) 'Europe's evolving security: drivers, trends and scenarios'.

Funded under the FP7 specific programme Cooperation under the theme Security.

<http://cordis.europa.eu/marketplace> > search > offers > 5923



## Are businesses using your personal information?

*EU project identifies ethical breaches in information and sets up laws to protect citizens. Balancing security with secrecy in medicine and industry is seen as paramount.*

Ethical concerns about the use of personal data, particularly in an intensive information society that we live in today, have been increasing. In real terms security and privacy are at the core of information and communications technology advancements. By altering the landscape of services and applications, these achievements affect the quality of life and fundamental rights of European citizens.

The EU-funded Ethical <sup>(1)</sup> project is enhancing the debate on ethical implications of data collection, use and retention in medical and biometric applications.

The project is supporting the creation of a roadmap towards a secure environment without compromising human rights. It is encouraging critical reflection on the deep relationships between knowledge and democracy. The Ethical project is also coordinating international debate in many areas such as data collection, code of conduct for researchers and requirements for medical data sharing.



The scientific work carried out by the consortium of research partners is reflected in the detailed report on the implications of data collection, use and retention. The ethics of data sharing, for example, between government





and industry have been examined and numerous examples have been gathered. This has resulted in a proposed list of checks and balances that help all parties adhere to privacy-related laws. It has also resulted in best practices for government-industry collaboration and recommendations for data sharing between both sides.

A study on ethical requirements for international biometric and medical

data sharing has also been completed. It contains existing laws and guidelines on data sharing, principles for ethical data sharing, and ongoing debates. Benchmarks for privacy recognition and international privacy principles have also been proposed.

Once adopted, these findings and recommendations will ensure that Europeans can feel confident their fundamental rights concerning the

treatment of data are respected. The findings will also balance medical and security priorities with the needs of citizens.

(1) 'Promoting international debate on ethical implications of data collection, use and retention for biometric and medical applications.'

Funded under the FP7 specific programme Capacities under the theme Science in society.

<http://cordis.europa.eu/marketplace> > search > offers > 5963

## There's nothing like the real thing

*New anticounterfeiting technology will ensure safe delivery of original beverages, cosmetics, medicines, electronics and much more. In times of economic difficulties, counterfeit products in many fields from food and medicine to perfume and electronics are seeping into the market.*

Advanced technological solutions are needed to identify counterfeit products and keep consumers informed. Counterfeiting is also a major global problem with important societal and economic consequences. It encourages organised crime, loss of jobs, evasion of tax revenues, and poses serious health and safety risks.

and applying readable marks for proper and rapid redirection of containers in production. It can effectively identify products throughout the supply chain and authenticate products to reduce the risk of counterfeit products entering the market.



An EU-funded project called SFERA<sup>(1)</sup> is taking up the challenge with marked success. SFERA has successfully developed a new laser-making system that addresses all issues related to the marking of containers. The system addresses product flow through production processes, effective traceability, and application of anti-counterfeit measures. It also involves marking containers without causing cracks or contamination

The engraving system developed during the SFERA project has built on cutting-edge technology to provide marking speeds suitable for the pharmaceutical industry and applications requiring large-area processing. SFERA built on an earlier EU-funded project called 'Non aggressive internal engraving laser system' (Naginels). As a result, SFERA managed to develop a new high-average power ultrafast laser and a high-speed

portable reading system. It also developed a high-speed beam delivery system and handling system, plus a specific process control and encryption model.

These components have been integrated in an industrial workstation, compatible with the requirements of the pharmaceutical industry among others. Many European countries from Belgium, France, Italy and the UK, in conjunction with industrial experts, have contributed to the project.

Another fringe benefit of packaging in cosmetics and any packaging that requires decor embellishment was the patented 'diffractive effect'. This combines anti-counterfeiting, traceability and a surprising rainbow pattern in the markings. The project also developed an option of marking readable codes in reflection, easing the integration of the process on production lines and expanding market opportunities.

The SFERA technology is much better than existing anticounterfeiting techniques for packaging such as inkjet technology, RFID tags and classic laser techniques. It has been recognised as 'best practice for anti-counterfeiting issues' and holds outstanding promise for many industries. Pharmaceuticals, cosmetics, perfumes, luxury goods, beverages, automotive parts and photovoltaic modules are a few sectors that are set to benefit tremendously.

(1) 'Sub-surface fast internal engraving and reading system for anticounterfeiting applications.'

Funded under the FP7 programme Capacities under the theme 'Research for the benefit of SMEs'.

<http://cordis.europa.eu/marketplace> > search > offers > 5996

## ESA offers the sun to the world

*The European Space Agency (ESA) has developed innovative software that makes it easy for people, regardless if they are experts or not, to access the entire library of images from the Solar and Heliospheric Observatory (SOHO) with a click of a mouse. The JHelioviewer is ESA's state-of-the-art visualisation software that gives people direct access to the sun.*

ESA scientists worked together with NASA experts to make this software possible. Developed as part of the ESA/NASA Helioviewer project, which seeks to design systems and services that enable users worldwide to explore the sun and inner heliosphere as well as to provide transparent access to the underlying data, JHelioviewer allows users to retrieve images from the sun from as early as 15 years ago.

According to the project partners, access to more than one million images from SOHO is now possible. New images from NASA's Solar Dynamics Observatory are added on a daily basis.

The web-based image browser Helioviewer.org complements the downloadable JHelioviewer.

The experts say this new software allows users to do so many creative things, including creating their own movies of the sun, exporting their finished movies in different formats and tracking features of the sun by compensating for solar rotation. They can also colour the images in any way they wish, and image-process the movies in real time.

'We wanted to make it easy to view solar images from different observatories and

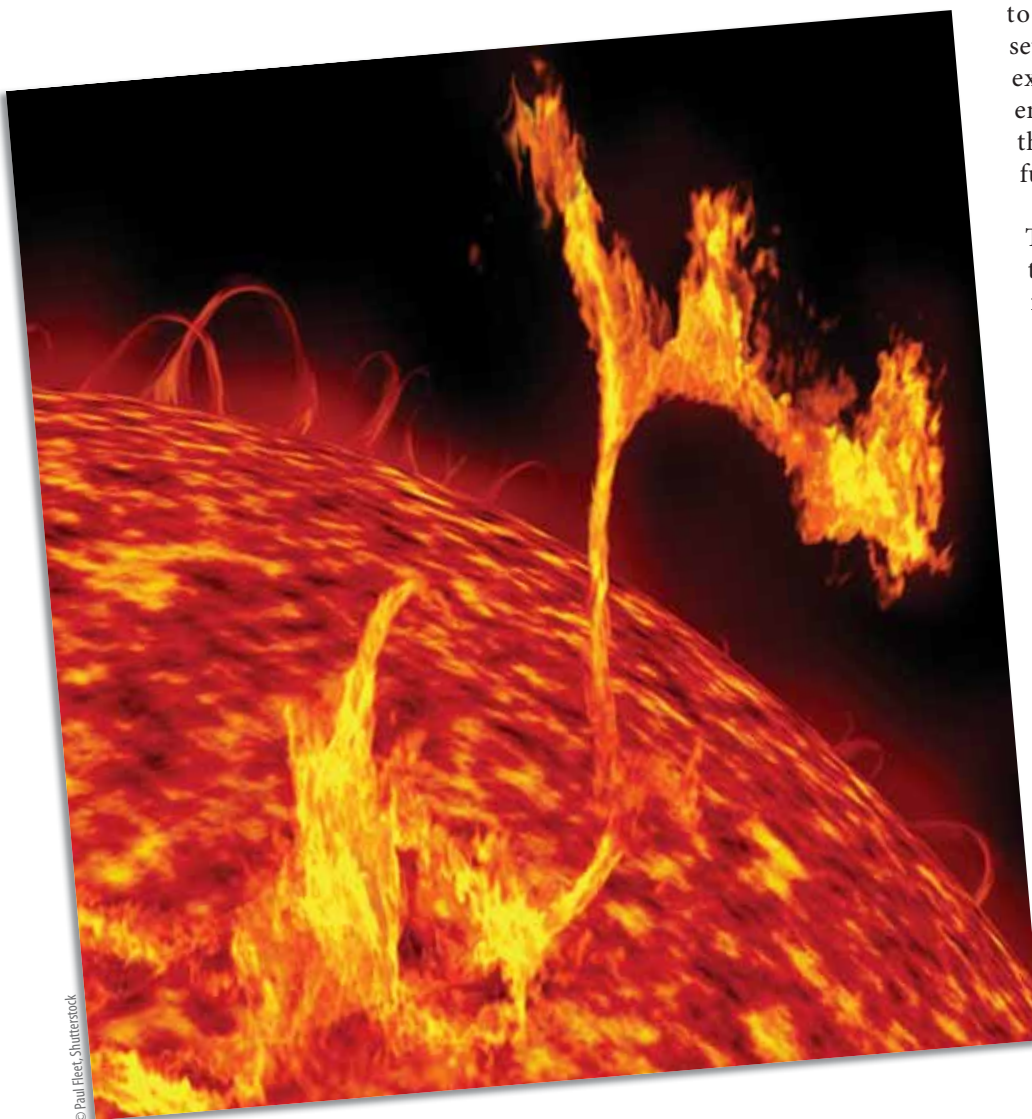
instruments, and to make it easy to make movies,' explained Daniel Müller, ESA SOHO deputy project scientist. 'Before, it took hours to combine images from different telescopes to make a movie of the sun for a given period. With JHelioviewer, everyone can do this in minutes. This is an interactive visual archive of the entire SOHO mission.'

The ESA team pointed out that JHelioviewer is written in the java programming language, which is why they inserted the 'j' at the start of its name. The beauty of this software is that it is open source, making all of its components free to the public. This allows users to improve the programme.

But that is not all. According to the team, the code can be reused for other purposes as well, namely for medical research and even for Mars data. This advantage is due to the fact that the JHelioviewer does not need to download entire datasets, which are typically quite extensive, but it can select enough data to stream over the internet without much fuss.

The data can also be annotated, such as marking solar flares of specific magnitude or highlighting diseased tissues in medical images.

'The goal of JHelioviewer, and the Helioviewer project as a whole, is to offer intuitive interfaces to large datasets from many different sources. In effect, it is a virtual observatory,' Dr Müller said.



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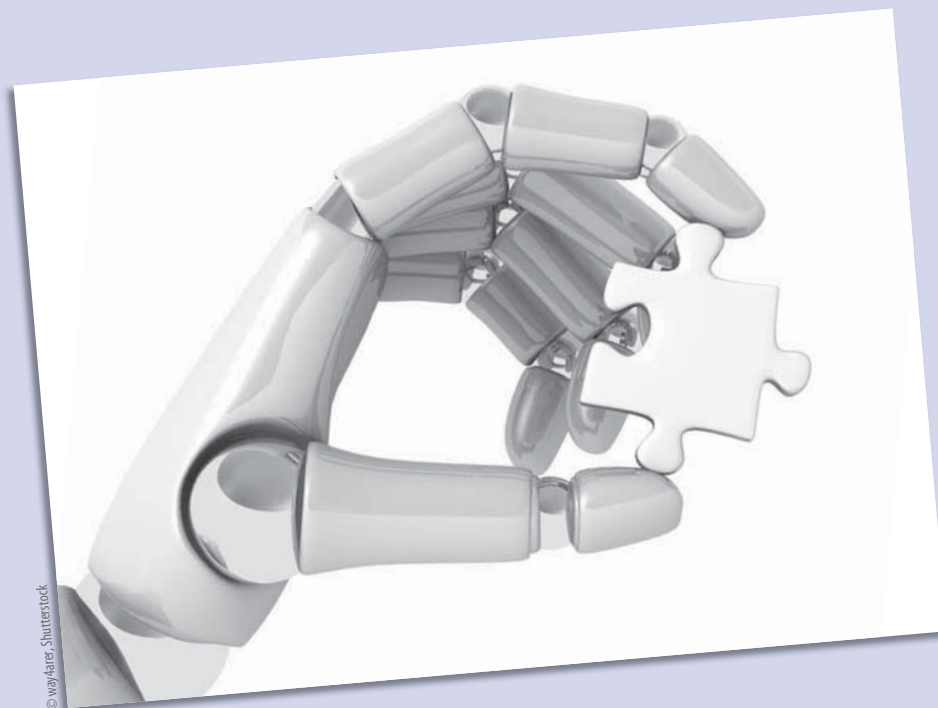
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Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 19353

## Fingertip sensitive robot to boost competitiveness

*EU-funded researchers have created a robot able to be employed at any modern industrial workstation with such advanced fingertip sensitivity it can even hold an egg without cracking it. They believe the invention will help keep European production competitive with the rest of the world.*

This innovative robot is an outcome of the PISA <sup>(1)</sup> project, which clinched EUR 7 million under the 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices' (NMP) thematic area of the EU's Sixth Framework Programme (FP6).

The workerbot can also inspect components over a continuous 24-hour period — an important advantage when precision is of the utmost importance, such as in the field of medical technology, where a defective part can, in the worst case scenario, endanger human life.



Another distinctive feature of the pi4-workerbot is that it has two arms. 'This allows it to carry out new kinds of operations,' said Dr Dragoljub Surdilovic, head of the working group at the Fraunhofer Institute. 'These robots can transfer a work-piece from one hand to the other.'

He explained that this could be useful, for instance, for observing complex components from all angles. Dr Surdilovic added that conventional robotic arms generally only have one swivel joint at the shoulder, while all their other joints are articulated. 'In other words, they have six degrees of freedom, not seven like a human arm,' he said.

Developed by the Fraunhofer Institute for Production Systems and Design Technology (IPK) in Berlin, Germany, the robot known as 'pi4-worketbot' is similar in size to a human being, and has two arms, three cameras, fingertip sensitivity and a variety of facial expressions. It is capable of making many more movements than a normal robot. It was designed to help manufacturers operating in Germany who need technology that can be adapted for and cope with a variety of product versions and fluctuating volumes.

A state-of-the-art 3D camera in its forehead captures its general surroundings, and the other two are used for inspection purposes. Matthias Krinke, managing director of pi4-Robotics, the company that is bringing the workerbot to market said these different cameras allow it to perform a wide range of tasks. 'It can measure objects or inspect a variety of surfaces,' he said. Mr Krinke pointed out that the robot can, for example, identify whether or not the chromium coating on a work-piece has been perfectly applied by studying how light reflects off the material. 'If you use two different cameras, it can inspect one aspect with its left eye, and another with its right,' he said.

However, as well as the swivel joint at its shoulder, the workerbot has an additional rotation facility that corresponds to the wrist on a human body. Dr Surdilovic's working group developed the control system for the workerbot. 'Programming the two arms to work together — for example, to inspect a work-piece or assemble two components — was a real challenge as it requires additional sensor systems,' he commented.

The researchers also endowed the robot with fingertip sensitivity. 'If you set the strength of the grip correctly, it will take hold of an egg without cracking it,' said Dr Surdilovic. And it even has a variety of facial expressions. 'If its work is going smoothly, it will smile happily, but if it looks bored it's waiting for work and the production manager knows the production process can be speeded up,' according to the team.

(1) 'Flexible assembly systems through workplace sharing and time sharing human-machine cooperation.'



## Nanomaterials making a huge difference

*Developments in nanomaterials are offering the building industry completely new options for indoor quality and health. The next step is to make the building industry aware of their existence and potential.*

Nanomaterials have been studied and developed with the intention of enabling better indoor quality and health and energy efficiency, amongst many other applications. The Clear-up <sup>(1)</sup> project undertook various work programmes in a number of areas where nanomaterials are able to make a significant difference.

These work programmes revolved around several concepts which included the validation and testing of

technologies, methods of control and materials in a doll's house test environment. A database of building descriptions was developed for use in the test or simulation environment, and specifications were defined for the interfaces between high-level control functions and various subsystems.

The performance of nanomaterials was investigated by looking at the use of photo-catalytics that improve air quality through the activation of light to

allow for the decomposition of VOC (volatile organic compounds) and NO (nitrogen oxides). To control indoor light quality and ensure the antibacterial action of ultraviolet light, day-light transport methods were designed to balance these.

Bringing these developments to the construction industry was another goal for Clear-up, presenting the information to validate their developments and to illustrate the potential of their use. The dissemination of information was conducted via logos, websites and the production of information materials for publication and media campaigns.

When the project ends, the expected results include the development of significant advances in building technologies that will improve health, quality of indoor living, and even energy efficiency. In addition, engineers, architects and homeowners will become very familiar with these advances and will be able to incorporate them into their designs, structures and homes.



(1) 'Clean buildings along with resource efficiency enhancement using appropriate materials and technology'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanoscience, nanotechnologies, materials and new production technologies.'  
<http://cordis.europa.eu/marketplace> > search >  
 offers > 6106



## Revolutionary nano-sheets to boost battery power

*EU-funded scientists have invented a new way of creating atom thin nano-sheets with the potential to enable the next generation of electronic and energy storage technologies needed, for example, to power electric cars. The research was funded in part by the Pepinen <sup>(1)</sup> project, which clinched a EUR 168 256 Marie Curie grant under the EU's Seventh Framework Programme (FP7). The research was recently published in the journal Science.*

Researchers from the Centre for Research on Adaptive Nanostructures and Nano-devices (CRANN) at Trinity College Dublin, Ireland and the University of Oxford, UK have discovered how to split layered materials to give atom thin nano-sheets. Using these sheets, they have created a range

of novel two-dimensional nano-materials possessing chemical and electronic properties that could enable new electronic and energy storage technologies.

For decades, researchers have tried to create nano-sheets from layered materials in order to unlock their unusual

electronic and thermoelectric properties. However, previous methods were time-consuming, laborious or of very low yield and so unsuited to most applications. In this latest study, scientists developed nano-sheets from a variety of materials using common solvents and ultrasound, employing devices similar to those used to clean jewellery. According to them, the new method is 'simple, fast, and inexpensive, and could be scaled up to work on an industrial scale.'

'Our new method offers low costs, a very high yield and a very large throughput: within a couple of hours, and with just one milligram (mg) of material, billions and billions of one-atom-thick nano-sheets can be made





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at the same time from a wide variety of exotic layered materials,' explained Dr Valeria Nicolosi, Royal Academy of Engineering Research Fellow in the University of Oxford's Department of Materials.

She said these new materials are also suited for use in next generation batteries known as 'supercapacitors', which can deliver energy thousands of times faster than standard batteries, enabling new applications such as electric cars. Many of these new atomic

layered materials are very strong and can be added to plastics to produce super-strong composites, Dr Nicolosi explained. These will be useful in a range of industries from simple structural plastics to aeronautics.

Her colleague, Professor Jonathan Coleman, principal investigator at CRANN and Trinity College Dublin's School of Physics, said: 'Of the many possible applications of these new nano-sheets, perhaps the most important are as thermoelectric materials,' adding that

'these materials, when fabricated into devices, can generate electricity from waste heat.'

Dr Coleman gave the example of how in gas-fired power plants approximately 50 % of energy produced is lost as waste heat, while for coal and oil plants the figure is up to 70 %. 'However, the development of efficient thermoelectric devices would allow some of this waste heat to be recycled cheaply and easily, something that has been beyond us, up until now,' he explained.

According to the scientists, their research can be compared to the work regarding the two-dimensional material graphene, which won the Nobel Prize in 2010. Graphene has generated significant interest because when separated into individual flakes, it has exceptional electronic and mechanical properties that are very different to those of its parent crystal, graphite, they explained. However, graphite is just one of hundreds of layered materials, some of which may enable powerful new technologies.

(1) 'Processing and electron probing inorganic nanostructures for emerging nanotechnologies'.

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<http://ec.europa.eu/research/infocentre> > search > 19933

## A boost for European automation

*Efficient manufacturing and processing requires coordination. By harnessing technologies capable of linking disparate automated components together in real time, European researchers have ushered in a new era of industrial automation.*

This means that, for example, a programmable logic controller (PLC) based in Munich is capable of communicating simply and effectively with automated machinery in Brussels, Marseille and Paris. This way of working opens the door to significant cost and time savings.

IT technologies for this sort of thing have tended to originate in the office world. While it has taken longer for such solutions to penetrate the world of industrial automation, the need for them has been just as acute. Europe's share of the automation sector, which operates in a highly competitive

globalised market, was estimated in 2005 at 25 % with regard to application and 32 % with regard to production of automation equipment. This suggests an exported surplus of European automation products of 7 %, underlining Europe's leadership. Europe cannot afford to forfeit its dominant market position because of a 'technology lag'.

As a consequence, a four-year EUR 11.8 million EU-funded project was launched in 2005 to specifically address this issue. The objective of EU-funded 'Virtual automation networks' (VAN) project was to adopt, modify and extend common office/IT solutions to

the industrial sphere in order to support knowledge-based, intelligent and agile manufacturing. The project partners, led by Dr Axel Klostermeyer, director of strategic projects and pricing, industrial communication at Siemens, were confident from the outset that the project would strengthen and consolidate European automation's global position by providing much-needed solutions.

### Raiding the standard

The VAN project focused on an important part of a flexible manufacturing automation scheme: the communication, both over a short and long distance, between different automation functions. The project set out to provide not only innovative solutions to this issue, but also to establish new standards dedicated to industrial environments, and to essentially fill the existing gap between office technologies and industrial automation technology.

'In the 1990s, fieldbuses began to be used as a means of communication, to link one machine to another,' explains Dr Klostermeyer. 'They were a means of sending signals from one controller to another.' The ethernet — the collective term for frame-based computer networking technologies for local area networks (LANs) — is used extensively in office environments, but its application in industry has been more limited.

'The issue was that several different standards were being used in factories,' stresses Dr Klostermeyer. 'However, around the year 2000, a trend began to emerge among several companies who were trying to use the ethernet also for industrial communication on the field level. With this came certain issues, such as security and real-time operation. This project emerged out of this need.'

The project partners believed that a breakthrough could be achieved through integrating a number of network concepts together, to form an applicable virtual automation network, which could be used in industrial automation. First of all, an independent analysis and survey of current needs was carried out. Implementation challenges and the possibility of using some

current state-of-the-art wireless communication technologies were then addressed.

'We started from the point of view that the ethernet is widely used in the office; the main idea was to use this IT technology for industrial communication.'

Two pilot tests were carried out. A biogas company with several separate plants in eastern Germany was used to see if the project could be implemented in the processing sector, while a manufacturing firm with a control centre in Germany and an automated robotic plant in Italy was used to trial the project in the manufacturing sector.

### Fully automated

The VAN project has made a significant contribution to the European automation industry through the development of an open platform that integrates networks for fast and flexible manufacturing. This platform enables communication between industrial applications and devices in a transparent, flexible and fast-to-configure way: perfect for the industrial environment.

In addition, the system enables remotely distributed applications to find each other by using VAN name

addressing and routing, and to establish secure, safe and real-time connections over wired and wireless networks communicating as if they were in the same LAN. In addition, the introduction and modification of originally office-oriented networks — such as ethernet and WLAN — allows the integration of both office and automation domains within a company, along with remote communication in distributed environments (i.e. plants located in different locations). This last feature allows engineering tasks to be performed remotely, enabling engineers to configure automation devices and systems without necessarily having to know the technology that is being used.

'The reason we called the project a "virtual automation network" was that it was virtual; it looks like it is one network, when in fact it is a combination of several,' explains Dr Klostermeyer. And while the project team didn't have to reinvent everything — they started from the already existing Profinet open industrial ethernet standard (IEC61158 - Type10) for example — the research represents a major step forward in industrial automation technology.

'There are still smaller issues to be solved but from a research point of view a big step has been made, and this technology is now well-established,' says Dr Klostermeyer. 'It is now more a question of development than research. Several things we invented during this project are now being turned into products.'

VAN project ([www.van-eu.eu](http://www.van-eu.eu)), which was completed in October 2009, was an integrated project funded by the European Commission under the 'Information society technologies' (IST) priority within the Sixth Framework Programme. The consortium consisted of 14 partners from four countries.

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## Research spurs on biotech-modified textiles

*Innovations in biotechnology and materials science are transforming Europe's textile sector. Researchers have investigated biotech modified textile materials for a number of possible uses, from 'smart' fashion to medical, transport and sports applications.*

Textiles are extremely versatile, combining different materials and structures for use in a wide range of applications. Besides the usual way we use textiles, such as in clothing and coverings, they are widely used in medicine, sport, transport, safety, packaging, the chemical industry, and more.

unique properties, such as tissue engineering for use in medicine.

Biotechnology, or more specifically enzyme technology, has enormous potential for the production and synthesis of textile materials, according to the research team headed by Ghent University, Belgium.



Biocatalysis — using natural catalysts, such as protein enzymes, to perform chemical transformations on organic compounds — has already proven its worth in industrial textile pre-processing of natural fibres. It has also been demonstrated that enzymes are able to modify the surfaces of synthetic textile materials, which paves the

way for advanced functionalities to be built into textiles. Europe is in a position to capitalise on this potentially lucrative market.

The research project Biotic <sup>(1)</sup> has worked on developing specific knowledge and technologies to create biotech-modified textile materials with

And this is where the 24-month Biotic project entered the picture in 2008. While a lot of research had focused on chemical or physical modification of surfaces, the introduction of functionalities using biotech was a relatively unexplored scientific area, according to the partners. The advantage of biotech, or more specifically enzymes, over other technologies is their high specificity towards a certain substrate, the partners suggested.

Biotic focused work on enzymatic modification and functionalisation of polyethylene terephthalate (PET), chemo-enzymatic surface functionalisation of textile materials, and incorporating biocatalysts into textile fibres.

In addition to breaking new ground in an emerging field, the Biotic team has made a valuable contribution to the bio-based economy. Thanks to EU-funded initiatives like this, Europe is staking its claim in a growing and exciting sector.

(1) 'Biotechnical functionalisation of (bio)polymeric textile surfaces'.

Funded under the FP7 specific programme People (Marie-Curie actions).

<http://cordis.europa.eu/marketplace> > search > offers > 5968

## Researchers observe carbon monoxide binding for first time

*EU-funded researchers have for the first time succeeded in directly observing carbon monoxide binding to metal-porphyrines, a process that the research team will now use to explain the physical and chemical processes on surfaces and in nanostructures.*

The research was funded in part by the Molart <sup>(1)</sup> project, which received a European Research Council (ERC) advanced grant worth EUR 2.57 million under the EU's Seventh Framework Programme (FP7).

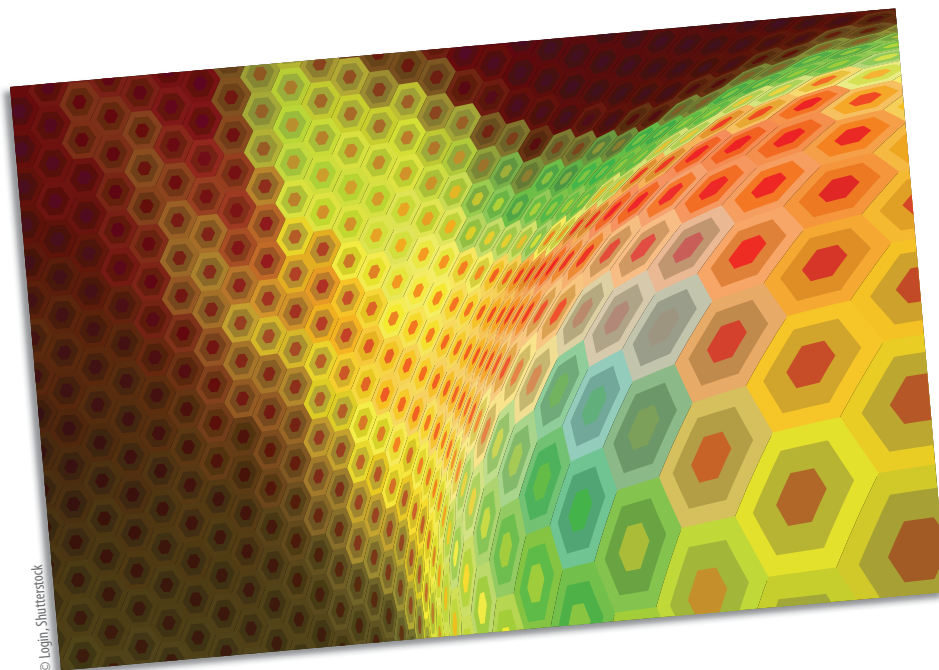
The mechanism for binding oxygen to metalloporphyrins is a vital process for oxygen-breathing organisms. Understanding how small gas molecules are chemically bound to the metal complex is also important in catalysis or the implementation of chemical sensors. When investigating

these binding mechanisms, scientists use porphyrin rings with a central cobalt or iron atom. They then coat a copper or silver support surface with these substances.

An important characteristic of porphyrins is their conformational flexibility. Recent research has shown that each specific geometric configuration of the metalloporphyrins has a distinct influence on their functionality. In line with the current state of research, scientists from the Technische Universität München (TUM) in Germany

expected only a single carbon monoxide (CO) molecule to bind axially to the central metallic atom. However, detailed scanning tunnel microscopy experiments revealed that two gas molecules dock between the central metallic atom and the two opposite nitrogen atoms.

According to the TUM research team, a critical component is the saddle shape of the porphyrin molecules, in which the gas molecules assume the position of the rider. The significance of the saddle geometry became apparent in model calculations carried out by Marie-Laure Bocquet from the University of Lyon in France. Her analysis helped the researchers understand the novel binding mode in detail. She also showed that the shape of the molecular saddle remains practically unchanged, even after the two gas molecules bind to the porphyrin.



the findings saying that ‘what’s new is that we actually saw, for the first time, the mechanism on a molecular level.’ He added that ‘we even can selectively move individual gas molecules from one porphyrin to another.’

The team is now aiming to explain the physical and chemical processes on surfaces and in nanostructures. Once these fundamental questions are answered, they will take on new challenges and investigate a series of questions, namely: ‘How big is the influence of the central atom? How does the binding change in planar conformations? How can such systems be utilised to implement catalysers and sensors through controlled charge transfers?’

The porphyrins reacted very differently when the researchers replaced the CO with stronger-binding nitrogen monoxide (NO). As expected, this binds directly to the central atom, though only a single molecule fits in each porphyrin ring. This has a significant effect on the electronic structure of the carrier molecule, and the characteristic

saddle becomes flattened, the researchers explained. The porphyrin, therefore, reacts very differently to different kinds of gas — a result that is relevant for potential applications, such as sensors.

Dr Willi Auwaerter, one of the authors from TUM, expressed his excitement at

(1) ‘Surface-confined metallocsupramolecular architecture: towards a novel coordination chemistry for the design of functional nanosystems’.

Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 19653

## Technology sorts out paper recycling

*EU-funded research is demonstrating that technology can help increase both quality and yield when sorting recovered paper, which in turn makes protecting the environment a more profitable venture.*

Getting people to put used paper products in the recycling bin rather than in the rubbish bin is only half the battle. If all different kinds of paper products, from newspapers to packaging, end up in the same bin, it is still necessary to sort the collected materials, which can be both a labour- and energy-intensive procedure.

The thinking behind the Sort it <sup>(1)</sup> project was to exploit technology to reduce both the amount of lost material and the energy required to sort recovered paper.

The project team has been investigating the potential of a number of different approaches. The concepts range from robots capable of physically separating the paper to sensors that sort according to colour and other characteristics.

The new sorting paradigms and equipment are to be tested out on different types of recovered paper. Feedback from these trials will be incorporated into a full life-cycle analysis, taking into account both financial and environmental parameters.

In addition to improving the management of paper waste, the Sort it findings are also expected to help guide future EU policy in this area.

(1) ‘Recovered paper sorting with innovative technologies’.

Funded under the FP7 specific programme Cooperation under the theme Environment.  
<http://cordis.europa.eu/marketplace> > search > offers > 6020



## Innovation patents to look after poor patients

*A European research team is working on a system that secures the needs of poorer patients while still encouraging innovation and investment in the pharmaceutical industry.*

As the international intellectual property rights (IPR) regime stands today, pharmaceutical companies protect their research and inventions via a 20-year global monopoly. Although this helps companies and their investors recoup investments and maintain a lead market position, it often means that potentially life-saving medicines do not reach those who need them most. Monopoly prices first look to recover investment costs and failure risks, which hinders

development of mutually beneficial supplier/buyer relations. This is most notable in the case of AIDS where a public health emergency has continued to worsen.

The EU-funded Innova-P2 <sup>(1)</sup> project is working to secure the needs of poor patients and still protect innovation and investment in the pharmaceutical industry. A truly interdisciplinary consortium, the project is exploring alternatives to the current system

by bringing together international experts from academic, policy-making, pharma and non-governmental organisations (NGOs) communities across a broad range of disciplines.

The project has four major objectives which include advancing knowledge and ethical insight into reform plans for the IPR system, finalising plans to amend the IPR system in the area of pharma innovation, securing support for the new system from China and India — the two most powerful emerging-country actors — and promoting urgent policy developments on IPR through consensus and a policy action plan.

Efforts to amend the current IPR system are in line with a major 21st century challenge (delivering reasonably priced health care to patients worldwide) that lies at the heart of biomedical ethics, which strive for sustainable world development. Innova—P2 is aiming at a potential two-tiered patent system that would give innovators a choice. By opting for a new Patent-2, inventors would not have veto powers over the reproduction of their inventions. This means that medicine would quickly become available at competitive market prices. The reward for Patent-2 holders would come from public funds, relative to the impact of their invention on the global burden of disease.

(1) 'Pharma-innovation – patent-2'.

Funded under the FP7 specific programme Capacities under the theme Science in society.  
<http://cordis.europa.eu/marketplace>  
 > search > offers > 6074



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## New stature for natural products chemistry laboratory

*The National and Kapodistrian University of Athens is Greece's primary state institution and one of Europe's biggest. Now it is striving to gain a foothold in EU research activities in the field of natural products chemistry.*

The main aim of the 'Nat force' <sup>(1)</sup> project is the scientific and technological reinforcement of the University of Athens' Laboratory of Pharmacognosy and Natural Products Chemistry (LNPC). This will extend and transform the LNPC's status to that of a Natural Product Research Centre comparable in standing with other European centres distinguished for their scientific excellence.

The project has secured state-of-the-art equipment that facilitates advanced research in the field of natural products chemistry and complements the

laboratory's already existing modern and powerful instrumentation. Nat force has also enhanced the LNPC's visibility and stature across the EU, and increased its participation in national and European research programmes — it is currently coordinating two EU FP7 projects.

The Nat force project has significantly boosted the LNPC's strategic partnerships and network activities, and enabled necessary technology transfer from well-established European research centres. Another advantage

has been improved scientific capacity by attracting experienced researchers already familiar with new technologies

*'The Nat force project has significantly boosted the LNPC's strategic partnerships and network activities, and enabled necessary technology transfer from well-established European research centres'*

and advanced methodologies. This will lead to the production of significant knowledge in and new applications of natural compounds in pharmaceutical, cosmetic, nutraceutical and agricultural sectors.

Strengthened scientific collaboration across the EU enhances international industrial partnerships and collaboration with well-known research centres. In fact, three highly reputable European research centres have been identified to further develop strategic partnerships: CNRS in France, the Technical University of Dresden in Germany, and the University of Basel in Switzerland.

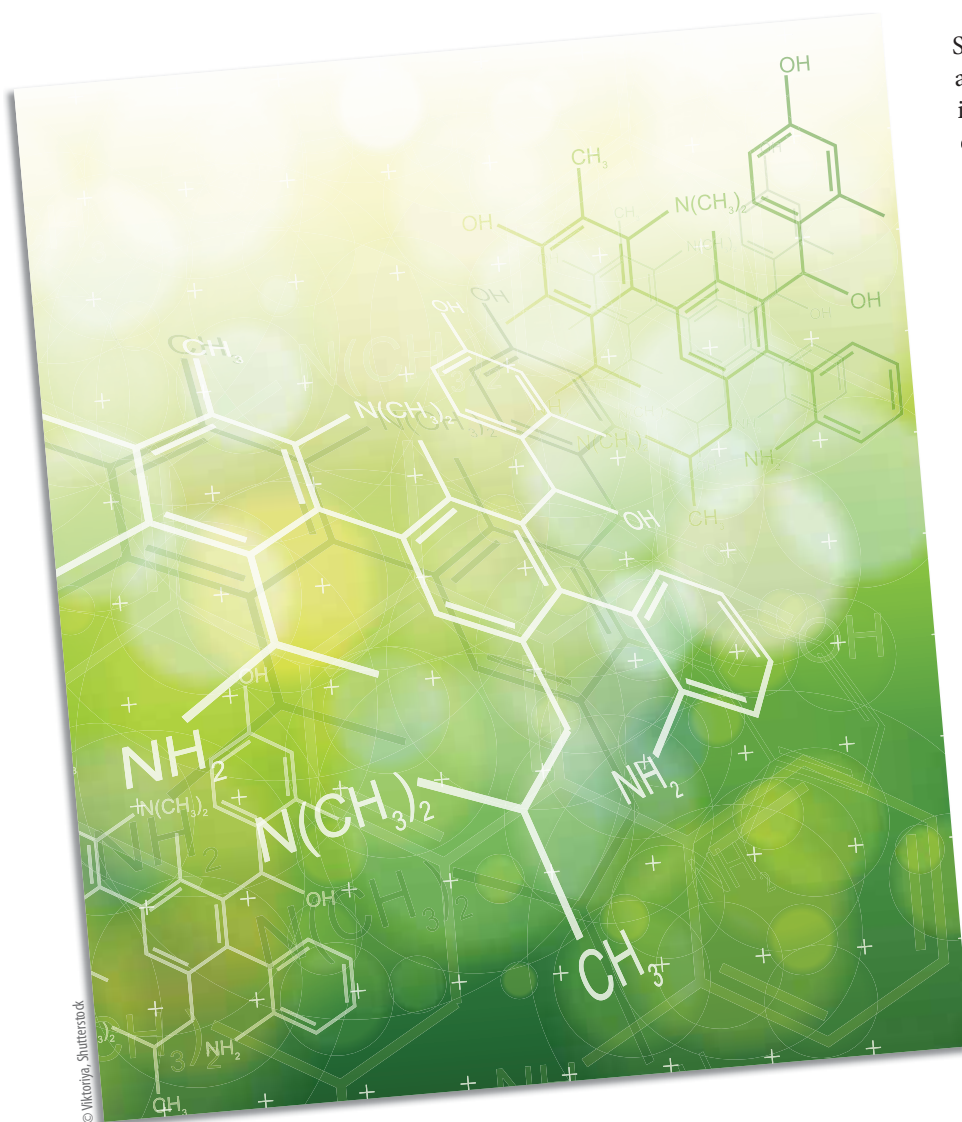
Achieving the objectives of the Nat force project will ultimately attract the attention of industry, stakeholders and other interest groups, and make a positive contribution to European integration.

(1) 'Reinforcing scientific and technological potential of the natural products laboratory — University of Athens'.

Funded under the FP7 specific programme Capacities under the theme Research potential of convergence regions.

Funded under the FP7 programme 'Regions of knowledge'.

<http://cordis.europa.eu/marketplace> > search > offers > 6080



The following upcoming events were selected from the event diary of the Directorate-General for Research and from the CORDIS event calendar.

For further information on past and upcoming events, please visit:

<http://ec.europa.eu/research/events>

<http://cordis.europa.eu/events>

### **B cells and protection: back to basics**

*A conference entitled 'B cells and protection: back to basics' will take place from 12 to 17 June 2011 in Sant Feliu de Guixols, Spain.*

Microbes populated the Earth long before the rise of eukariotic cells which are the basic building blocks of most life on earth. In order to survive, these initial mono- and multi-cellular organisms had to develop mechanisms of adaptation, cohabitation and defence against bacteria, fungi and viruses.

One of these mechanisms, the B cell, is mediated by immunoglobulins in the serum and at mucosal surfaces. B cells and their antibodies play a fundamental role in the immediate and late defence against microbes and in controlling of commensal microflora. B cells also protect the organism from viruses neutralising them before infection.

Over the past few years, B cells have been receiving more attention and study. For example, B cells are now the cellular target of a new generation of vaccines against human immunodeficiency virus (HIV).

The event will be divided into seven sessions, with time for short talks, a poster session and other activities.

*For further information, please visit:*  
<http://bit.ly/cujiKn>

### **Web science 2011**

*A conference entitled 'Web science 2011' will be held from 14 to 17 June 2011 in Koblenz, Germany.*

Web science deals with the full scope of socio-technical relationships that are engaged in the world wide web. The field is based on the notion that understanding the internet involves not only an analysis of its architecture and applications, but also insight into the people, organisations and economics that are affected by and subsumed in it.

The conference will take an interdisciplinary approach, integrating computer and information sciences with a multitude of disciplines including sociology, economics, political science, law, management, language and communication, geography and psychology. This conference is designed to bring stakeholders from these areas together for creative and critical dialogue.

*For further information, please visit:*  
<http://www.websci11.org/>

### **Religion, gender and human rights: challenges for multicultural and democratic societies**

*A conference entitled 'Religion, gender and human rights: challenges for multicultural and democratic societies' will take place from 21 to 25 June 2011 in Linköping, Sweden.*

The event will examine the nexus of religion, gender, identity, human rights and politics with a particular focus on Europe in a context of globalisation. Four topics will be centre-stage:

- moving gender from the periphery to the centre of contemporary debates about the role of religion in public and political life;
- stimulating new feminist and gender scholarship concerned with the critical (re)interpretation of religions and gendered faith-based practices across different religious traditions;
- applying an 'intersectional' lens to issues of religion, gender and women's human rights, and bring into dialogue feminist theorising on gender and religion across global south and global north perspectives;
- expanding the horizon of gender-focused human rights analysis at the nexus of religion, gender, citizenship and rights.

Attendees are expected to include senior and emerging scholars across a range of relevant disciplines including political science and international relations, sociology, gender and women's studies, human rights and socio-legal studies, development, anthropology, European studies and religious studies.

*For further information, please visit:*  
<http://bit.ly/hqDKTI>

### **Cyberforensics 2011 — international conference on cybercrime, security and digital forensics**

*A conference entitled 'Cyberforensics 2011 — international conference on cybercrime, security and digital forensics' will take place on 27 and 28 June 2011 in Glasgow, UK.*

Cybercrime is an area which covers the use of a computer or network for such things as financial scams, computer hacking, virus attacks and information theft. These activities are increasingly common, may originate in any country, and can target individuals or organisations in other parts of the world.

The field of security encompasses all aspects of policy, technical measures and other precautions that seek to protect systems, services and data within an organisation or home. Digital forensics is the application of analysis and investigation techniques to determine the presence and nature of computer (or technology) based criminal activity.

Specific topics that will be addressed at the conference are set to include:

- cybercrime scenario analysis and reconstruction;
- techniques for evidence collection, search, analysis, correlation and preservation;
- victim profiling;
- monitoring and incident response;
- tools and techniques for network forensics;

- methodologies for digital forensics;
- forensics of mobile and embedded devices;
- forensic software tools and applications;
- attack strategy analysis and modelling;
- privacy, legal and legislation issues;
- forensic-enabled architectures and processes.

For further information, please visit:  
<http://www.cyberforensics.org.uk>

### International workshop on genomic signal processing

*The international workshop on genomic signal processing will be held on 27 and 28 June 2011 in Bucharest, Romania.*

Genomic signal processing studies measurable events, principally the production of mRNA and protein that are carried out by the genome.

Significant recent advances in genomic studies have stimulated synergistic research in many cross-disciplinary areas. The continuously increasing volume of data produced by the current high-throughput sequencing and microarray technologies requires specific genomic signal processing techniques to extract useful information and knowledge.

The main purpose of the workshop will be to bring together specialists from various fields of engineering, mathematics and computer science, as well as biology and medicine, as well as those interested in genomic signal processing, functional genomics and systems biology.

For further information, please visit:  
<http://gsp2011.dsp.pub.ro>

### Fifth international conference on methodologies, technologies and tools enabling e-government

*The fifth international conference on methodologies, technologies and tools*

*enabling e-government will take place from 30 June to 1 July 2011 in Camerino, Italy.*

Public administrations around Europe are making an effort to provide more sophisticated e-government services, such as offering one-stop services and supporting personalisation.

While strategies, methodologies and realization of e-government services vary significantly between the various actors and stakeholders, the alignment of information and communication technology with the processes and objectives of the service providers is playing an increasing role in service management.

The conference will bring together researchers and practitioners active in the area of electronic government with a focus on the role played by the information and communication technologies. It will be a forum for participants from different perspectives and disciplines to present innovative methodologies, technologies and tools, share experiences and lessons learned from case studies.

For further information, please visit:  
<http://conferences.cs.unicam.it/metteg11>

### Eleventh central European conference on cryptology

*The eleventh central European conference on cryptology will be held from 30 June to 2 July 2011 in Debrecen, Hungary.*

Until modern times, cryptography was concerned largely with message confidentiality and the conversion of messages from a comprehensible form into an incomprehensible one and back again. With the internet, however, cryptography has grown and developed in dramatic and unforeseen ways.

The aim of the conference is to bring together researchers in all aspects of foundations of cryptography, and related areas, theoretical or applied. Topics to be discussed include:

- encryption schemes;
- signature schemes;
- general cryptographic protocols;
- design of cryptographic systems;
- key management;
- computational difficulty;
- one-way functions;
- zero-knowledge proofs;
- pseudorandomness;
- information assurance;
- security in information systems;
- coding theory.

The conference is one of a series which is organised annually in one of the following central European countries – Austria, the Czech Republic, Hungary, Slovakia and Poland.

For further information, please visit:  
<http://www.eerqi.eu/page/about-eerqi>

### Seventeenth international conference on digital signal processing

*The seventeenth international conference on digital signal processing will take place from 6 to 8 July 2011 in Corfu, Greece.*

The conference will look at the theory and application of filtering, coding, transmission, estimation, detection, analysis, recognition, synthesis, recording, and reproduction of signals by means of digital devices or techniques.

As a field, digital signal processing deals with the representation of signals by a sequence of numbers or symbols and the processing of these signals. The goal of digital signal processing (DSP) is usually to measure, filter and/or compress continuous real-world analog signals. DSP algorithms have long been run on standard computers, on specialized processors called digital signal processors, or on purpose-built hardware such as application-specific integrated circuit.

For further information, please visit:  
<http://www.dsp2011.gr/call>



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