



# research<sup>eu</sup>

## RESULTS SUPPLEMENT

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**Editorial coordination**  
Evi Ford-Alexandraki

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**Reaching the 3 % threshold**



*Investing in research in a world increasingly driven by innovation would be stating the obvious. Yet, compared to other major world economies, the EU is finding it difficult to invest more in research. This is despite the commitment in 2002 by EU Heads of State or Government in Lisbon to increase the EU's investment in research from 2 to 3 % of its GDP by 2010. Nevertheless, since 2002 many tangible measures have been taken by the EU and its Member States and regions to increase research funding. Some of the projects benefiting from these measures are presented in this issue of the research\*eu results supplement.*

*The opening article of the biology and medicine section is dedicated to an often neglected issue: depression and anxiety following illness. The Cerise project studied more specifically the prevalence and severity of depression and anxiety with patients that have suffered a stroke. By doing so it aimed to improve the quality of life for these patients.*

*The energy section opens up with a project whose ambition it is to improve a 40-year old equipment design for measuring electrical magnitude. Whereas traditional electric current measurement transformers operate using magnetic flux variations, the IELAS consortium has managed to develop a model that uses mechanical waves.*

*In a society increasingly mindful of health and environmental issues, the Sus-chain project, highlighted in the environment section, analysed a number of food supply chains in different EU Member States. The researchers involved aimed to create a common conceptual structure to develop and enhance sustainability, while at the same time highlighting the distinctiveness of these chains.*

*The number of elderly EU citizens is increasing constantly and with it the need to provide appropriate healthcare and rehabilitation services. Whereas it is relatively easy to supply these services in cities, this is less obvious in rural areas. The lead article in the IT and telecommunications section describes how the Teledoc project tackled just this issue, by making use of virtual reality techniques.*

*The industrial technologies section highlights the LVD project, whose aim was to find ways to best implement the modalities stemming from the adoption of the Low-voltage Directive. This particular article describes how the project looked into support for laboratories where cabling can be tested to the required standards established by the directive.*

*The two-page events section offers you a selection of announcements for forthcoming events in the field of research.*

*As we are always striving to offer our readers the best possible information, we appreciate receiving your feedback on this issue, and on the research\*eu publications in general. Questions or suggestions can be sent to: [research-eu-supplements@publications.europa.eu](mailto:research-eu-supplements@publications.europa.eu)*

*The editorial team*

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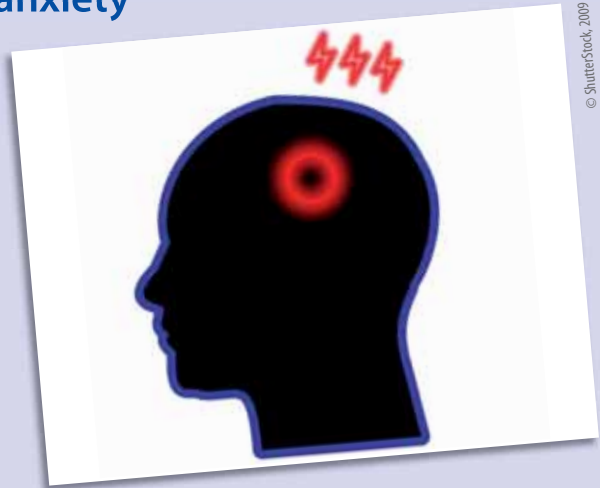
## Assessing post-stroke depression and anxiety

*A comparison study was conducted on the prevalence and severity of post-stroke depression and anxiety among four rehabilitation centres across Europe. Efforts were made in the hope of better rehabilitation services for stroke patients in order to improve their quality of life.*

The severity of stroke leading to functional and motor impairment can have a significantly negative impact on the patient's daily life. As a result this can lead to depression and anxiety. The Cerise project closely examined the prevalence and severity of both disorders after stroke in a collaborative longitudinal study in order to determine predictors and outcome.

The 'Hospital anxiety and depression scale' was used to assess 532 consecutive stroke patients at two, four and six months after stroke and predictors and time course were assessed. Results showed similarities across centres regarding severity and prevalence of depression and anxiety. Factors relating to severity of both affective disorders included severity of stroke, functional and motor impairment and sensory deficit. Living alone prior to stroke was associated with the severity of anxiety. Factors related to the severity of depression included cognitive disorder, dysarthria, pre-stroke Barthel index and age.

Concluding evidence showed the similarity of prevalence and severity of depression and anxiety in four European centres up to six months after a stroke. Due to the risk of patients becoming depressed or anxious during that period, monitoring for both affective disorders is vital. The multivariable models showed a sig-



nificant link between initial functional disability and both depression and anxiety. This indicates the correlation between psychological and functional recovery after stroke.

The results were disseminated in a scientific paper and presented at conferences in cities across Europe. For further information, please visit: <http://faber.kuleuven.be/onderzoek/dep3/neuro/cerise>

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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## Clearing the pathways to anti-cancer therapy

*European scientists have researched the pathways involved in the development of cancer cells. In particular, the role of metalloproteases has been elucidated, some of which are potent promoters of malignancy.*

The development of cancer is a web of biochemical events. As a result of the chemical cascades taking place, other cells can come under control of the tumour cells. Consequently, a multitude of genes and enzymes is involved in these developmental pathways. Some of these can be targeted and their progression blocked therefore providing effective cancer therapy.

Matrix metalloproteinases (MMPs) have been shown to play a key role in the development of cancer malignancy. As such, previous research has led to their development as tumour therapy agents. Unfortunately, unpleasant side-effects have been recorded in clinical trials. The EU-funded project 'Profiling MMP inhibiti' therefore aimed to define the role of metalloproteinases at the pathway level in order to elucidate and predict their effects.

Depending on structure, members of the group metalloproteinases can have totally opposed roles. As a first step therefore, project partners at the University of Liège in Belgium identified which metalloproteinases were cancer promoters and which had an inhibitory effect. The latter could then be excluded as molecular targets.

One promising candidate was MMP14 which acts an angiogenic factor and stimulates the development of new blood supply for the tumour cells. This proteinase acts in concert with two others that are strongly expressed by cancer cells and recruit neutrophil and myofibroblast cells in the development of the cancer. Ironically, these cells usually play a benign role in immunity and wound healing respectively.

One valuable outcome of this research is that the data supports a previously held hypothesis regarding cell interaction. The team observed that growth factors can activate MMPs on stromal cells (connective tissue cells) and worse, simultaneous induction of MMP production by the tumour cells.

The information from this research has been widely disseminated through scientific journals. This study has illustrated how a cell's role can be distorted depending on its biochemical environment. Key molecules in the pathway from normal tissue to aggressive tumour have also been identified. The design of improved anti-cancer agents is undoubtedly the next step.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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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

## Genetic fitness of fish under scrutiny

*A cut in numbers can reduce the intraspecific genetic variability within any population. Consequently, as part of a bid to further protect European fish stocks, scientists are continuing studies to determine the degree of genetic variation in Atlantic herring.*

Genetic variability within a population is very important because it allows changes through selective pressure in response to environmental stresses. Without biodiversity, a population may be more prone to extinction. The phenomenon of overfishing therefore may have more than just a direct effect on population numbers.

The aim was to start the process of long-term comparisons regarding genetic variability within Atlantic herring populations. In order to fulfil this objective, the EU-funded Hergen project continued the study of herring conducted some 20 years ago. Fish were

sampled at 12 locations in the region from the Baltic through to the North Sea.

Project partners from Stockholm University collected over 2 000 herring to obtain samples of muscle, liver and eye tissue for genotyping. Eleven polymorphic loci for variant forms of enzymes (allozymes) were studied. The team used microsatellite DNA with a normally high level of intra-specific polymorphism.

In order to make temporal comparisons, 5 of the 12 locations were common to the previous study. Refinements made to eliminate error included

sampling of spawning aggregations that consist of fish of the same size rather than individual spawning fish only.

The Hardy-Weinberg principle which states that allele and

genotype frequencies remain in equilibrium from generation to generation unless specific disturbing influences are introduced was applied in the statistical analysis of the results. Furthermore, any significantly different outcome in pairwise analysis regarding change in genetic status was subject to Bonferroni correction.

The previous research revealed that there was very limited differentiation of genetic variability at the allozyme loci. The data from this subsequent study suggests that the situation has not changed significantly. Continued genetic sampling of our fish stocks will be required to test the genetic fitness of populations. This is especially crucial if overfishing threatens to undermine natural genetic variability, one of the main keys to adaptation.

Dissemination of this study data was achieved through scientific publications, conferences and directly to those involved in fishery management. It is expected to form a continuing and integral part of sustainable management of our threatened fish stocks.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training.

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## Preserving the genetic biodiversity of Atlantic herring

*The Danish Institute for Fisheries Research coordinated a project under the 'Life quality' programme to investigate genetic biodiversity in Atlantic herring, a species threatened by overfishing.*

The Atlantic herring (*Clupea harengus*) is an integral component of the prosperous fishing industry in northern Europe. Sustainable management of herring stocks requires knowledge of the genetic diversity of the species. Aiming to improve upon earlier research to quantify herring biodiversity, the Danish Institute for Fisheries Research organised a new experiment in the context of the Hergen project.

Samples were taken from herring populations in the Skagerrak, Kattegat and western Baltic at 10 different spawning locations over a period of two years. The Danish scientists used microsatellites, small repeated segments of DNA, to resolve genetic variation. In total 1951 fish were analysed, culminating in the genotyping of nearly 200 specimens.

Statistically significant differences were detected that were consistent over the duration of the experiment. The geographic origin of the herring turned out to be an

important factor: the greater the distance between specimens, the greater the degree of genetic variation. In addition, salinity was indicated as a possible selective factor to explain differences between fish caught in the salty North Sea and those caught in the shallower, more brackish Baltic Sea.

These findings reveal that while herring can travel substantial distances during their lifetime, their genetic make-up is primarily determined by the location where

they were spawned. This information will be used to guide policy-making aimed at preserving the biodiversity of these valuable fish stocks.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

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## Harnessing nature's diagnostic tools for disease prevention

*The earlier cancer is diagnosed, the better the chance of effecting a cure. A revolutionary new hybrid technology offers the possibility of detecting this and other diseases right at inception.*

Within a few years, when the technology comes to market, every doctor's surgery could have a small, inexpensive device which can test blood on the spot and warn of impending illness before any symptoms become apparent.

With a head start of billions of years over human scientists, nature has developed incredibly complex organisms, tools and systems which we are still struggling to understand let alone emulate. Put simply, there are things evolution has achieved that people can only dream of. And among these are natural diagnostic tools which help us to recognise when something foreign, a cold virus say, has invaded our bodies and to fight it.

When we have a sore throat and a runny nose, it means our body has identified a disease invasion, diagnosed exactly what the disease is, and created antibodies to fight it. We might feel bad, with our bodies being the battlefield, but after a few days the antibodies win out, the cold virus is neutralised, and equilibrium returns.

Scientists have known for some time how the body sets about diagnosing the problem. But the process is so complex, and takes place at such a microscopic level, it has been impossible for us to replicate it to help in the fight against diseases like cancer which the body cannot usually beat off by itself.

An ambitious EU-funded research project, which goes by the acronym of Receptronics, is taking an unconventional approach by harnessing nature's tools and combining them with the best of nanotechnology and electronics to produce a revolutionary new method of disease detection.

At the heart of the process is molecule recognition, and specifically recognising individual molecules, something the human body does all the time. For medical purposes, the type of molecule which needs to be recognised is called a biomarker, and its presence can indicate a disease is starting well before there are any other symptoms.

In order to recognise biomolecules, nature has developed receptors, which are mirror images of the molecules being sensed. Every single type of biomolecule has its own receptor in nature.

The researchers on the project have brought together their different disciplines, including biochemistry, bioengineering, nanotechnology and information technology to replicate this process and develop a hybrid device. Results to date show the technology the project has developed is far more precise than anything else which is being used, which allows for much earlier detection of biomarkers.

Explains project coordinator Professor Marco Tartagni of the University of Bologna,

Italy: 'The idea is to use bioengineering to harness the natural biological process for molecule recognition, and to put it together with state-of-the-art electronics. The front end of the system is composed of bioengineered receptors that are very similar to those generated by nature and specifically designed to target molecules, put together with man-made microelectronic systems at the back end. The results are very promising and we could soon unveil the best and most precise method ever developed of sensing single molecules.'

Professor Tartagni points out it can be months or even years after the first biomarkers have appeared before full-blown cancer develops. 'What is needed is a very smart sensor which can precisely detect concentrations of a wide range of molecules, and the only way to get the required precision is to count molecules one by one. Nature has developed a way to do this, and we are trying to do exactly what nature does,' he says.

While the three-year project officially ended in September 2008, the partners are so enthused by the results they have already achieved that they have agreed to self-fund at least another year of working together. 'We have pioneered techniques which are working very well, and we now need to tie them together. We are working at a compact and affordable point-of-care biomarker detection device which can be made commercially available,' he says.

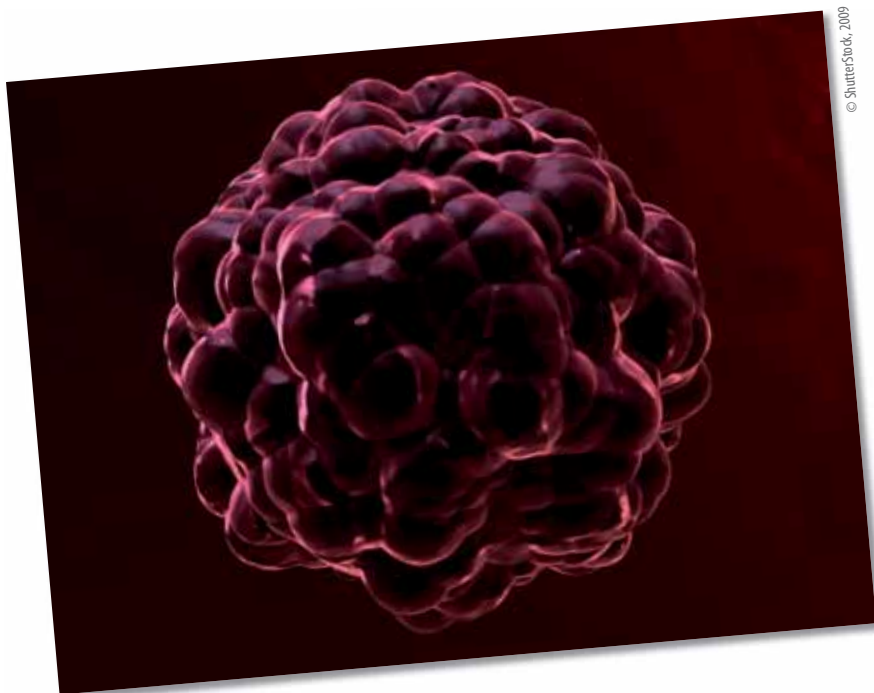
While mass production of the devices is probably still a few years down the road, an earlier commercial application of the systems Receptronics has developed is likely to be in the pharmaceuticals industry.

The development of new drugs takes up to 15 years from the time research starts until they are commercially available. This is because the drugs need to be checked in every possible situation and their interaction with every type of cell surface studied.

'Around 95 % of this research involves how drugs interact with, and try to regulate, the receptors hosted in body cells. And our new techniques can be used to make instruments which can check and test the molecules very quickly, thus greatly reducing the time required for the drug-screening process,' he says. It is no exaggeration to say the techniques developed by the Receptronics researchers could truly revolutionise both diagnostics and the development of new medicines.

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## Infant protein and energy intake in relation to obesity

*A dietary assessment which examined the energy and macronutrient intakes in the first two years of life was conducted producing results that may help combat a contributor to adult obesity.*

Obesity is a major health concern across Europe posing serious short and long-term health risks for those affected as well as high costs for health care and social security systems. This has highlighted the importance of prevention strategies which begin in early childhood. Genetic disposition and lifestyle factors are not the only contributors to obesity. A high-protein diet in the first few months of life may predispose individuals to an increased risk in obesity later in life.

Infant formula and complementary foods are shown to have a high protein content. The Chopin project has investigated types of infant feeding regimes during the first two years of life differing in their protein and fat contents. More specifically the project examined whether these differing feeding regimes impact an early marker of obesity development such as the difference between length at two years of age versus length at birth.



A statistical analysis of energy and macronutrient intakes in the first two years of life was conducted and results were produced. The analysis included formula-fed infants from five European countries using two formulas (high and low protein content) up to 12 months of

age. A parallel reference group was composed of breastfed infants.

The dietary assessment consisted of a weighed food record over three consecutive days for formula and breastfed infants. The precise amount of milk or other solid foods consumed by infants in monthly intervals up to the age of nine months and again at 12 months of age was recorded by parents and caregivers. Nutritional data was verified entered and stored. Specific nutritional items taken into consideration were energy, animal and vegetable protein, amino acids, alcohol, fats and fatty acids, vitamins, minerals and carbohydrates.

It was concluded that the intakes for breastfed infants were lower in energy and fat but higher in carbohydrate compared to intakes for infants that were fed formula. Furthermore the introduction of solids increased the intake of proteins in both groups in similar ways.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

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## Breast milk best for averting obesity risk

*Dietary factors in early life can play a significant role in overall development. The differences between infants who are breastfed and those who are formula fed, in terms of how this may 'programme' risk of becoming obese, was investigated in this study.*

Obesity in children is a health issue which has been given the spotlight in recent years. Many factors play a part in the development of obesity; direct factors could include having a genetic disposition and the lifestyle choices made by the individual or their parents on their behalf. It is also the case that indirectly, the nutrient intake during infancy could have a 'programming effect' on later obesity risk.

A study conducted in Germany and Spain, under the umbrella of the EU-funded project Chopin, examined the protein content in feeding formula and complementary foods and breast milk. The aim was to identify the differences in protein and fat contents and how this may influence the total energy expenditure of formula fed and breastfed infants at six months old.

The researchers collected data from 66 cases. They found that total energy expenditure per body weight was higher in the breastfed group and lower in the high-protein formula fed group but that the differences

did not constitute a statistically significant outcome. However, the data collected suggested that protein intake during the first months of life could be related to adiposity and excess fat in later life.

The results showed that total fat mass was lower for the breastfed than for the low-protein

formula fed infants. The research report made the inference that a six month old infant fed on low- or high-protein formula from birth had, on average, experienced a 14 to 21 % increase in total fat mass compared to those infants which were breastfed at least for the first three months.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

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## Biogenic amines in cheese and wine

*In recent years there has been some concern over biogenic amines (BAs). These compounds are found in cheese and wine and may cause allergic reactions when consumed.*

The production of cheese and wine fermented by lactic acid bacteria (LAB) is an important industrial activity in Europe. The



metabolic activities of LAB play an essential role in food preservation. They can contribute in a positive or negative way to the taste, smell, nutritional and health properties of food and beverages. The decarboxylation of amino acids leads to the production of BA which possess unwanted toxic properties. The Decarboxylate project studied the individual acid and amino acid decarboxylation pathways.

Decarboxylate isolated different strains of common LAB species from traditional Spanish and other European cheeses and used colorimetry to identify tyramine and histamine producers. Results were confirmed by using the polymerase chain reaction (PCR) techniques developed by the project. LABs were also isolated from traditionally produced Argentinian cheeses and dairy products and tested. The results

showed that high levels of the tyramine producer, *Enterococcus*, were found in both European and Argentinian cheeses.

The ability of commercial starter cultures to decarboxylate histidine were investigated using colorimetric and enzyme-linked immunosorbent assay (ELISA) techniques. All the strains tested were found to be negative. Colorimetric methods were also used to analyse *Lb. hilgardii* strains from wine and their ability to produce tyramine. The Decarboxylate project developed the unique qPCR assay to analyse wine samples collected from all over Bordeaux. Results indicated that the vast majority of the samples contained bacteria that produce histamines. In some areas the wine contained highly variable levels of histamines. Therefore, there was no certainty that the distribution of histamines is dependent upon geographical location. It may be as a result of the differences in the make-up of the wine and the production process.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

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## Molecule transporters in food spoilage

*Biogenic amines are a common source of spoilage in fermented foods and beverages. Research scientists have investigated an important component of the biochemical pathway involved in their production.*

Lactic acid bacteria (LAB) are used in the fermentation of foods like yogurt, sauerkraut and sausage. One of their metabolic pathways produces carboxylic acids from carbohydrates. In milk products for example lactose is converted to lactic acid. The acidic nature of the milk is a preservative as most of the other microbes it contains are not so acid resistant.

Of course, LABs have many complex pathways, some of which are not so desirable. One of these is the production of biogenic amines (BAs). Generally, these are the result of the conversion of an amino acid to its corresponding amine, a classic one being histidine to histamine. The biochemical reason behind these particular pathways is energy production.

The EU-funded project Decarboxylate aimed to study the pathways involved, the ultimate goal being to develop strains unable to produce biogenic amines. A project team from the University of Groningen in the Netherlands studied molecular components of two types of energy producing pathways, proton motive force and that involving the energy storage molecule adenosine tri-

phosphate (ATP). Regardless of the mode of energy production, there is always a transporter molecule involved in the process. This is responsible for uptake of a precursor molecule and excretion in the cell of the final biogenic amine.

The scientists studied three of these so-called precursor/product exchangers: histidine/histamine, tyrosine/tyramine and agmatine/putrescine. Putrescine, aptly named, gives rise to the rotting smell of decaying meat. Using state of the art techniques, the transporters were identified, characterised for their molecular weight and their mode of action studied.

The genes responsible for the transporters were cloned on transportable pieces of DNA, plasmids. These special plasmids encoded the genes to produce the transporter molecule plus a chemical

tag that helps to identify the molecule during study. These plasmids were then transformed into a common LAB, a *Lactobacillus*, and observed. Control cells were used as a means of comparison of activity.

The results of this work form an important basis for further study of biogenic amine production in food processing. The outcome will be safer, amine-free food and a more competitive European food production market.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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## Mimicking nature in human tissue engineering

*The 'Tissue reactor' project has developed a novel three dimensional porous calcium phosphate (CaP) scaffold on which human tissue can grow. The scaffold dissolves upon growth completion.*

Much like constructing a building, tissue requires a scaffold through which it grows. Such a scaffold needs to be both porous for the tissue while supported to have available space to grow. The structure must also be bioresorbable as, after tissue implantation, the scaffold is no longer needed and must

harmlessly dissolve. The 'Tissue reactor' project, as its name suggests, has developed an actual production line for human tissue growth.

The methods are particularly applicable to hard tissue growth like bone tissue or cartilage. Firstly, such connective tissues have been engineered in the laboratory, in vitro. But what is more important these tissues will be applied as tissue substitute in bone surgeries, in vivo.

Central to this project's exciting research has been the development of a state of the art scaffold. To construct it, apatite minerals have been used. Apatite is a group of phosphate minerals that may contain hydroxide (OH), fluoride (F) or chloride (Cl) anions in their crystal structure. It is of course no coincidence that these minerals were used. Our bones and our teeth contain apatite minerals.

Coatings made from these minerals have been applied to various substrates. A recently developed biomimetic method has been employed to coat these substrates mainly through precipitation of an apatite layer. This approach imitates the biological natural conditions of apatite formation. Moreover the substrates must be biotolerable or bioinert and therefore polymeric materials have been used.

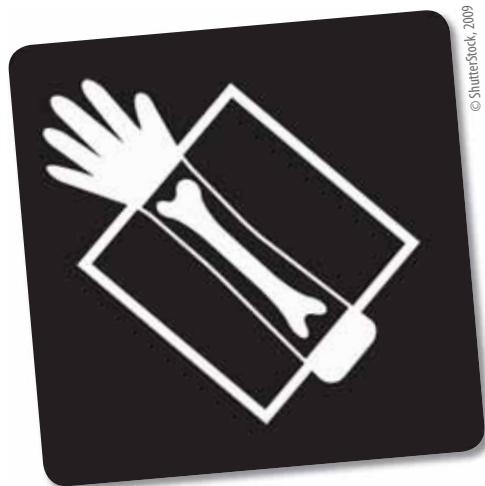
Controllable porosity is yet another crucial property the scaffold must possess. With the aid of a wet chemical method nano-sized apatite particles have been produced and characterised by transmission and scanning electron microscopy. With these, porous particles can now be prepared.

The 'Tissue reactor' research is expected to remove many obstacles encountered in bone replacement surgery.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4073



## Bio-engineering tissue good enough for the knee

*Damage to the meniscus is a common debilitating condition. Researchers have investigated different cell types and their ability to generate meniscus tissue substitutes for use in knee joint arthroscopies.*

Injuries leading to disruption of the integrity of the protective meniscus in the knee joint can cause knee pain and ultimately osteoarthritis. As the meniscus cushions and spreads the load in the knee, this can lead to disruption of the stability of the joint and significant loss in life quality.

The overall aim of the EU-funded project 'Meniscus regeneratio' was to emulate as closely as possible the structure of this vital tissue and engineer a tissue replacement. In order to achieve this, autologous cells would be bio-engineered on a bioactive and biodegradable scaffold.

Members of the consortium based at the Tissue Engineering Group in Basel, Switzerland, performed trials on different cell types to deduce which would produce the most suitable replacement tissue graft. The cells selected for comparison were from human inner meniscus, fat pad, and synovial membrane. Articular chondrocytes were also used in the trials.

The cells were induced to form tissue using a growth factor on a hyaluronan-based scaffold

in vitro and using mice models. The resulting tissues were judged according to their glycosaminoglycan (GAG) content and correct production of collagen types in the different regions of the meniscus. As a reference, the collections of cells were compared with native human menisci.

Only articular chondrocytes formed tissues with the necessary amounts of GAG and cell types compatible with both inner and outer meniscus cell phenotypes. Further research is required to fully test whether the tissue generated will attain the complexity of natural meniscus cartilage. However, other groups have applied the bio-engineered tissue in damaged sheep knee cartilage and extension of the trials with human meniscus repair was planned.

The knee is a complex structure and advancements in tissue engineered

for an effective 'good as new joint' would be welcome in the sports field and the ageing population generally.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support; manufacturing agreement; private-public partnership.

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## Source of wine contamination studied

*Fungi that contaminate food and drink can cause food poisoning by the production of toxins. An EU-funded project has investigated the occurrence of the mycotoxin Ochratoxin A (OTA) that causes wine spoilage.*

OTA is a mycotoxin that can cause kidney damage and is classified as a human carcinogen. Its presence in wine is strictly controlled using sampling during the wine production procedure and concentration limits. Contamination starts in the vineyard and it is in the interests of the grape producer to employ good agricultural techniques to minimise outbreaks of the fungi responsible.

Project partners from the 'Wine-ochra risk' project studied the fungi responsible for the

toxin in southern Europe and Israel. They also investigated the periods during cultivation when risk of infection was greatest. Furthermore, information for growers most at risk could be derived from maps produced based on geographical distribution of the fungal pathogen.

The pathogens responsible were all species from the group *Aspergillus* section *Nigri*. They found that the inoculum is invariably present in vineyards but, like most pathogens, it is an

opportunistic and thrives in certain conditions. One major factor was berry damage linked to entry of the spore to the grape flesh substrate. Damage can be abiotic, including rough handling of the bunch of grapes. In the biotic category, a whole host of other pathogens can cause breach of the grape skin

that will facilitate entry by the fungus. These include insect damage and other microbial infections causing skin rupture.

The crucial time of development was from early berry ripening (known as veraison) and harvesting. OTA could be found in berries that showed no symptoms but concentrations were found to be higher in berries with the characteristic symptoms.

The same team of scientists from the Italian Università Cattolica del Sacro Cuore also mapped the geographical distribution in Europe and Israel. Trends were found that could be helpful in prediction of outbreaks of the disease. Generally, incidence increased going from west to east and from north to south.

This research formed a significant basis for further investigation into the incidence of OTA in the grape harvest. As with the pathology of any disease, the factors involved are complex and specific to the requirements of the pathogen. Meteorological data could be one further avenue of investigation.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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## Exploring bioactive compounds in knot wood and bark

*The anti-microbial and anti-adhesive effects of 21 wood extracts were tested and their health promoting and preservative potential explored. This project represents a concerted effort to explore the up until now undervalued potential of European forest resources in this research area.*

European forest resources have not been fully exploited for their potentially beneficial properties in relation to pharmacological or biological substances. The Cerberus project examined the highly specific extractive from knot wood and bark and how these bioactive compounds may hold naturally occurring pharmacological benefits. In particular, it is the bark and knot wastes from the pulp and paper industries which were examined for their multipurpose applications. Wood extractives from selected European trees were isolated and examined.

The bioactivity of these compounds was tested as anti-microbial agents and their health promoting and preservative potential was investigated. One benefit which gave an added value to this research project was the removal of knots and barks from the pulp and processing line. This reduces chemical consumption and the associated costs,

improves waste management and creates new industrial opportunities in terms of jobs.

The anti-microbial and anti-adhesive effects of the crude extracts were tested as part of the project. Tests on 21 extracts were carried out against micro-organisms to detect the most effective method to fight problems of biocide resistance by microbial strains. The most potent extracts were also studied for anti-adhesive effect on materials including stainless steel and glass.

Five extracts were shown to be the most of potent. These were ethanol extracts of knots from black pine, maritime pine, poplar, eucalyptus and oak. The most effective concentrations were determined for each bacterium.



Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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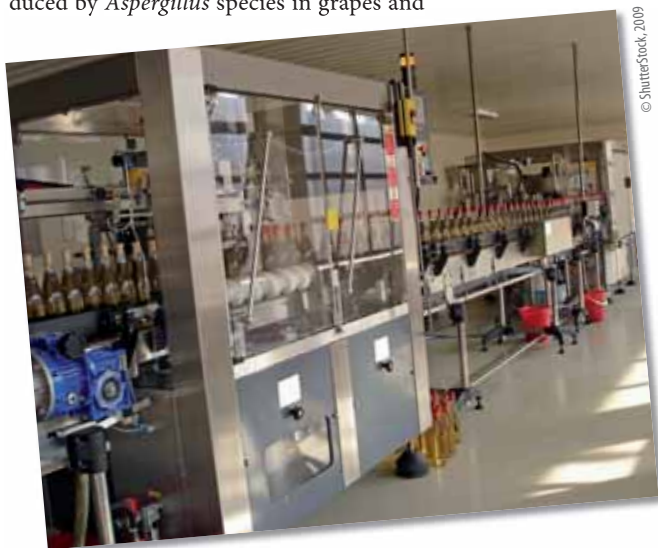
## Post-harvest treatment for toxin-free wine

*Wine making requires scrupulously clean conditions to restrict the growth of microorganisms not involved in the fermentation process. Scientists from the project 'Wine-ochra risk' have tested the efficacy of post-harvest sterilisation and storage techniques to prevent the production of the mycotoxin Ochratoxin A (OTA).*

Crop production is always at risk from the presence of pathogens. Not only do they inflict physical damage from growth and reproduction but some produce harmful toxins. These may not be physically evident in the food or drink and therefore pose a hidden threat to health.

One of these persistent toxins, OTA is produced by *Aspergillus* species in grapes and

could therefore present itself to unsuspecting wine drinkers. OTA is a potential carcinogen and toxic to the kidneys. The fungi that produce this chemical are natural pathogens of the grape and inoculum is usually present in vineyards. Sound agricultural practice can help avoid contamination but inevitably some of the fungus can be present in the grapes.



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Scientists at the Volcani Centre in Israel studied post-harvest treatments as a means of reducing OTA content in wine. Two types of trials were designed and executed. The first simulated storage of grapes during various conditions and treatments. Samples were then inspected for isolate number and OTA concentration. The second

involved plating grape samples on agar after storage and counting the number of *Aspergillus* isolates after sterilisation treatment was applied on the plates.

Sulphur dioxide (SO<sub>2</sub>) is an antioxidant and helps prevent microbial spoilage. It is used in the wine bottling process and initial sterilisation of the equipment. Different concentrations of SO<sub>2</sub> generating pads and ethanol dips as a means of sterilising were applied. Time and temperature were also varied in the storage experiments.

At all storage temperatures, control and grapes with ethanol dips contained *Aspergillus niger* and *A. carbonarius* with OTA content at a later stage. Interestingly, no isolates were recovered from SO<sub>2</sub>-treated grapes. In the plate tests, SO<sub>2</sub> at the relatively low level of 0.5 parts per million (ppm) lowered the number of isolates by up to half. At 5 ppm, no isolates at all were recovered.

Wine producers are keen to maintain the safety and quality of their product. On the basis of this research, post harvest treatments can help the wine industry achieve this goal.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4430

## Enzymatic activity in biogenic amine formation

*Biogenic amines pose specific health threats to consumers and can be a major cause of food poisoning. The EU-funded Decarboxylate project focused on the key chemical reactions leading to the formation of biogenic amines during the fermentation process in dairy and wine products. This key reaction is known as decarboxylation and it is also responsible for a series of favourable effects on the quality of the fermented product.*

The microorganisms responsible for the decarboxylation reactions leading to biogenic amine formation are known as lactic acid bacteria (LAB). Understanding LAB physiology and biochemistry is a crucial step in allowing scientists to differentiate between the different decarboxylation reactions and eventually inhibit the formation of the toxic biogenic amines.

Researchers have verified that at the enzymatic level the enzyme responsible for the movement of the substrate and the end product in out of the cell is a carboxylate transporter. Given their crucial position at the beginning and end of the decarboxylation pathway these enzymes warranted fur-

ther study within the framework of the Decarboxylate project.

Project partner University of Groningen studied the binding site of the transporter enzyme aiming to gain further knowledge which might eventually lead to new inhibitors of biogenic amine formation. The studies revealed a number of structural details, previously unknown, which might indeed pave the way for innovative developments. Further examination is needed in order to arrive at solid conclusions regarding the interactions between substrate and enzyme.



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Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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## Increasing resistance to scrapie in sheep flocks

*Researchers introduced genetically resistant breeding rams to flocks infected with scrapie and the infected flocks were then carefully monitored. Results showed, for the first time, that selective breeding could be effective in combating scrapie in commercial flocks.*

Scrapie is a fatal degenerative disease found in the brains of sheep and goats and is caused by an abnormal protein known as a prion. It is one of several transmissible spongiform encephalopathies (TSEs), which are related to bovine spongiform encephalopathy commonly known as BSE or mad cow disease. Scrapie has been known since the early 18th century and does not appear to be able to infect human beings.

The EU introduced a breeding programme in sheep to reduce the threat to human health from the theoretical risk of acquisition of BSE by sheep. The Scrapiefreesheep project validated the breeding strategy under field conditions. The aim of the project was to eradicate scrapie in infected flocks and to strengthen resistance to the disease in the entire sheep population.



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The average number of new infections caused by a single infected animal was signified as the basic reproduction number of that infection ( $R_0$ ). This gives a measure for the spread of infection within a flock. The length of time it takes to achieve control depends on the original genotype profile and initial transmission levels within the flock.

The conclusion drawn was that if the reproduction number within these flocks drops significantly below one, scrapie transmission can be brought under control within one to seven years of selective breeding. In order to achieve an  $R_0$  value of less than one, the number of sheep with no resistance alleles (ARR) in the flock does not have to be reduced to zero.

As a result of the control measures employed the reproduction number fell. The force of infection also fell, being the rate at which susceptible individuals become infected by the disease. However, it may take some years between the reduction in  $R_0$  and consequent reduction in the force of infection because of the long incubation period for scrapie. The removal of scrapie susceptible ewes based on their genotype has had a positive effect in reducing both  $R_0$  as well as the force of infection.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

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## Tackling depression via onset prediction

*An innovative risk tool has been developed, marking the first instrument in the field of psychiatry able to predict the onset of clinical depression in primary care.*

Depression is a serious medical illness that can have negative effects on all aspects of a person's life. Therefore proper diagnosis and treatment is of utmost importance. Although depression is a major public health problem in Europe, there was previously no method for predicting onset and maintenance of depression.

In light of this the Predict project has explored the risk for the onset and maintenance of episodes of depression among primary care attendants in seven European countries. Nearly 900 attendants ranging in age from 18 to 75 were inscribed from urban as well as rural general practices in each country.

The objective of the research was the development of a cross-European multifactor risk score instrument. This can be used by general practitioners to predict the onset of depression. In order to test for international applicability, the instrument was validated in Chile.

A diagnosis of major depression was made using the composite international diagnostic instrument. The evaluation was repeated 6 and 12 months later. Only patients not depressed at baseline were included. A risk equation was derived from the European data based on 11 of the 39 risk factors calculated at baseline.

During the three years that followed, findings were disseminated in publications such as international medical journals of general medicine, psychiatry and primary care. Additionally, findings were presented at international conferences which



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cover these areas. The results are intended to be used for a risk assessment intervention tool to help prevent depression in primary care in the future.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4675

## Egg envelope proteins provide a key to cryopreservation

*Cryopreservation of fish gametes is an important process in intensive aquaculture and the conservation of fish biodiversity. Faced with difficulties in the freezing of oocytes, scientists have researched into the biochemical properties of egg envelope proteins.*

The preservation of gametes opens up a whole range of possibilities for the geneticist, conservationist and the end-users which include relevant industries and ultimately, the general public. To achieve flexible broodstock management, genetic improvement of parental material and progeny, and to maintain biodiversity, cryopreservation of the basic genetic material in gametes is essential.



The freezing of fish spermatozoa is a common procedure but to successfully preserve yolk-laden ova is beset with difficulties. One obstacle is the vitelline envelope of the egg. Unfortunately, it is potentially impermeable to cryoprotective agents (CPAs). On the other hand, it can serve as a potential source of protein markers as indicators of oocyte viability and stage of development.

The EU-funded project Cryocyte took up the challenge to research into the cryopreservation of fish oocytes whilst maintaining full viability from egg maturation, through to fertilisation and embryo development. Two types of fish that share the same ovarian reproductive strategy were selected for study — the gilthead seabream (GSB) and the common animal model, the zebrafish.

Partners at Örebro University in Sweden focused on the proteins of the zona pellucida, the glycoprotein layer around the plasma membrane of the egg. This structure is essential for oocyte survival, fertilisation and the prevention of the cross-breeding of species. It is also responsible

for binding spermatozoa and initiating acrosome action.

The team also investigated the timing of gene expression with regard to vitelline envelope development. They found three new isoforms of ZP proteins in the seabream that were dually expressed in liver and early oocytes. They also collected data on another six ZP proteins regarding timing of gene expression and deposition within the vitelline envelope. Furthermore, the varying amounts of the ZP proteins in the envelope in seabream and the zebrafish were quantified.

Dwindling fish stocks and loss of biodiversity are priority issues on a worldwide scale. Furthering this research will help ensure that sustainable fisheries management can be implemented. Interested parties can access the Cryocyte website at <http://cryocyte.ocean.org.il/Public/Projects-Overview.html>

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4637

**See also page 38 (Aquaculture cryopreservation video guide)**

## Physical representation of the subarachnoid space

*Physical models representing the subarachnoid space and the spine were created to aid in the development of the latest generation of microendoscopes.*

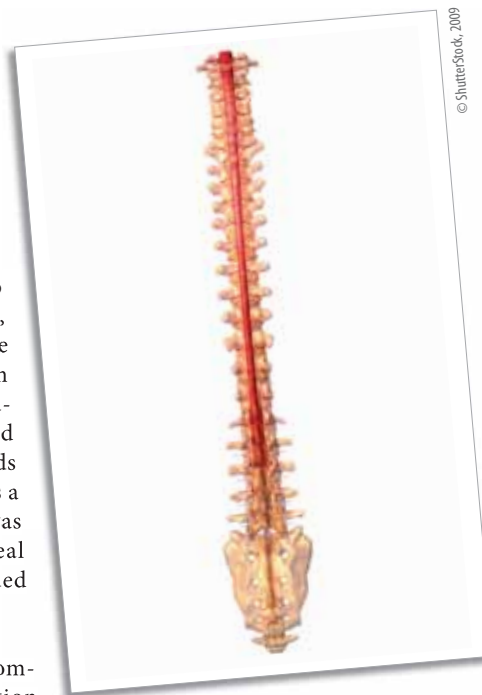
Three major technical improvements are expected to take place in the biomedical field. The first, telemedicine allows the medical community to be interconnected by telephone, internet or other networks and the second is robotics, which will improve surgical accuracy. The third advancement is in the development of microinstruments and endoscopes, which now allow direct access to areas never before reached by surgery.

Many disabled people have suffered damage to the spinal cord. This may be the result of an accident, cancer, degenerative disease or a congenital malformation. The Minosc project has designed and evaluated a flexible microendoscope, which enables surgeons to view directly the damaged spinal cord.

The position control system of the microendoscope was carefully defined,

with simulations carried out on two physical models. One transparent, simplified model was similar to the subarachnoid space and based on geometrical anatomical characterisation. The subarachnoid space is filled with cerebrospinal fluid and surrounds the spinal cord. The other model was a full-scale replica of the spine. This was based on volumetric images of a real human body and made from moulded silicone.

The two physical models of the anatomical structures allowed high resolution endoscopic simulations to be successfully carried out. This was as a result of their realistic representations of the human body, which helps in the development of new medical techniques and procedures.



Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; marketing agreement; manufacturing agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4502

## Neurology of self-motion awareness

*Researchers have identified previously unknown neural pathways involved in the perception of self-motion. The ageing population within Europe is constantly presented with challenges related to sustaining their quality of life.*

One essential component is to maintain mobility and this is not just the case of musculo-skeletal fitness. Movement perception and the ability to react accordingly particularly in kinetic situations, such as driving, are also crucial.

The appropriately named EU-funded project Eurokinesis aimed to examine all



organic and psychological factors involved in the deterioration of movement perception in patients, particularly the elderly. Data collected could then be used to devise ergonomic and rehabilitation programmes to maintain skills involved in day to day physical activities including driving.

Project partners at the Centre National de la Recherche Scientifique (CNRS) in France used conventional and transneuronal tracers to study the generation of eye movements, orientation and perception in macaque monkeys. Data was therefore collected on the polysynaptic connectivities between three key areas regarding eye movement. These were the motion sensitive areas of the parietal cortex (dorsal stream), the

vestibular cortices and the motor areas in the cortex involved in eye movement.

Given the polysynaptic nature of these three areas, the data collected was vast but one outcome stood out in particular. Previously, it had been thought that vestibular input reached the visual areas of the dorsal stream indirectly. However, the team's results showed a strong direct ascending oligosynaptic pathway consisting of a few neurons. This has very strong implications for the function of some of the parietal cortex areas in question. They can now be regarded as receiving direct information from vestibular organs and therefore play a critical role in self-motion detection.

One application of this research is to help elucidate the mechanics of spatial hemineglect by vestibular stimuli where patients fail to be aware of items to one side of space. Databases constructed can also form the basis for further studies with the aim of development of programmes to alleviate the effects of ageing on motility.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4687

## Immunisation research challenges the Maedi visna virus

*Small ruminant lentiviruses cause persistent inflammatory infections in goats and sheep. Researchers in the MVAC project have developed a new protocol for the detection and quantification of one these, the Maedi visna virus (MVV), in blood and tissues.*

The MVV infects the respiratory system, udder and blood forming tissues in sheep and goats. This in turn causes respiratory problems and loss of body condition. It is passed on in utero during pregnancy and in colostrum to the young suckling animal. Horizontal transmission occurs through the respiratory route, particularly in enclosed barns. The incubation period is a lengthy three to four years.

Eradication and control of the disease therefore requires an effective vaccination strategy. As part of this, a reliable test for the detection of the infection within herds must be available. In response to this demand, members of MVAC developed an assay based on real-time polymerase chain reaction (PCR) to determine the presence and levels of infection of the virus.

To accomplish this, the team focused on two genes, gag and pol. Gag codes for the viral matrix, proteins on the inner surface of the envelope, the capsid and nucleoproteins. Pol

is crucial in that it codes for reverse transcriptase which converts the viral RNA into DNA that is then incorporated into the host nuclear material.

Primers, starting points for transcription and dual-labelled probes were designed for gag and pol for strain EV1 of the MVV. When the sensitivity of both gene detection protocols was evaluated, it was found that the gag assay had superior sensitivity.

The test can be used to detect pro-virus DNA, that is, DNA that has been integrated into the host. It can also determine the presence or absence of messenger RNA (mRNA)

in blood and tissues. The protocols developed could form the basis of field tests although the test was specifically designed for strain EV1. Further work and field trials would therefore be required for the test to be used for routine diagnosis.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4569



## Interleukin and interferon assay for sheep

*In the search for an effective vaccination strategy against small ruminant lentiviruses, researchers have developed real-time assays for interleukin and interferon in ovine peripheral blood cells.*

Under the auspices of the MVAC project, scientists at the Centre National de la Recherche Scientifique (CNRS) in Marseilles have completed research that can be applied to vaccination studies generally. However, the team focused specifically on the *Maedi visna virus (MVV)* which has so far presented obstacles to its control due to the lack of data regarding immune responses.

Within a few weeks of infection or vaccination of an animal with MVV, provirus DNA can be found in peripheral mononuclear cells. Interferon-gamma (IFN $\gamma$ ) and interleukin-4 (IL4) are produced as biochemical responses by T cells. The scientists developed real-time polymerase chain reaction (PCR) tests to detect these biochemical changes within the immune system.

The primers, namely the start points for replication of genetic information used in the amplification process were obtained from previously published gene sequences. The PCR assay can be used for IFN $\gamma$  and IL4

messenger RNA (mRNA) produced from T cells as a response to antigens specific for strain EV1 of the virus.

The MVV is an economically important viral disease of sheep. It infects its host for life and is insidious in that most infections are sub-clinical. Most worrying for farmers perhaps is that its presence in a flock can mean marketing and export restrictions.

A sensitive rapid assay for the infection or vaccination status of animals would be a valuable tool for livestock farmers, not only for lentiviruses but for other bovine and ovine diseases. Further



research on the speed and throughput of the assay developed was suggested to increase its value in animal husbandry.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4588

## Rapid genotyping for complex bowel disease

*Inflammatory bowel disease is a complex pathology with a polygenic basis and influenced by multiple environmental factors. Researchers have devised means to implement high throughput genotyping to store in an integrated database established by an EU project.*

The complex nature of inflammatory bowel disease (IBD) means that the exact nature of the biochemistry of the condition is extremely hard to categorise. This in turn leads to inaccuracies in diagnosis and a pos-

sible delay in treatment for many affected patients.

This provided the impetus for the EU-funded project 'Genetics of IBD' to adopt a systematic approach to further elucidate the polygenic basis of the disease. The aim was to apply proteomic and genomic techniques on a mass scale with validated molecular abnormalities to be used as therapeutic targets.

The team based at the University Hospital of Schleswig-Holstein in Germany specifically aimed to implement a system of high throughput genotyping of single nucleotide polymorphisms (SNPs). These would then form the basis of further research as an extensive integrated database incorporating some 2.3 million SNP genotypes during the lifetime of this research project.

Obtained from public databases, details of mutations detected were typed into sibling pair families and triplets, if appropriate. High through-

put TAQman assay was used in the typing of both in microtitre plates. The fixed layout achieved was one factor that determined the rapid processing of the samples along with the TAQman procedure itself. TAQman real-time polymerase chain reaction measures the accumulation of the product, not at the endpoint of the PCR as is conventional, but at the exponential stages which makes the process inherently more rapid.

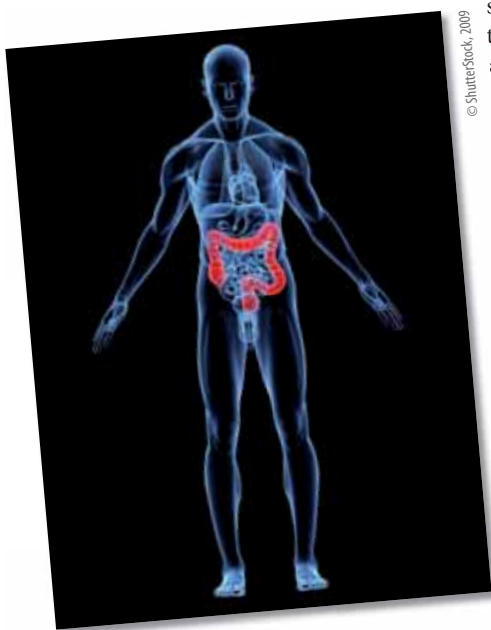
The TAQman plates were read and imported into the integrated database established by the project. Coordinates were assigned to each patient from the 384 or 96 well plates. Given the code, a genotype could be assigned to each individual. Furthermore, a quality control was derived from the controls on each plate.

To achieve a cost cut of a factor of ten during the project, multiplexed SNPlex for genotyping was implemented. This allows the simultaneous typing of 48 SNPs against one sample. This means that further research using this project's database and methods will have a competitive edge.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; financial support.

<http://cordis.europa.eu/marketplace> > search > offers > 4620



## Towards effective therapy for mantle cell lymphoma

*Members of the project consortium 'Anticancer retinoids' have investigated the action of retinoic acid against mantle cell lymphoma (MCL) at molecular level.*

MCL is a non-Hodgkin's lymphoma that initially responds to certain types of high-level chemotherapy but then goes on to progress with a poor prognosis for the patient. However, one possible therapy involves the use of retinoic acid which has been shown to inhibit primary MCL cell cultures as well as established cell lines.

The overall objective of the EU-funded project 'Anticancer retinoids' was to research the effectiveness of retinoids as potential drug therapies against a range of cancers. Project partners at Centro di Riferimento Oncologico di Aviano in Italy made MCL the target of their research. In particular, they aimed to outline the pathways involved in retinoid action.

The team found that certain genes were upregulated and some were inhibited as a result of retinoid action. The scientists also noted that retinoic acid (RA) acted either on its own accord to prevent further differentiation of cancer cells or in conjunction with other anti-cancer agents.



Autonomous action included upregulation of a protein that binds to complexes leading to the inhibition of cyclin-dependent kinase 4 (CDK4) activity. This enzyme is required to maintain and initiate tumours. Treatment with RA also decreases the levels of phosphorylated (active) Akt which is involved in cellular survival pathways.

By contrast, in conjunction with retinoid X receptor (RXR), retinoic acid receptors (RARs) mediate MCL cell growth inhibition. The anti-viral compound interferon-A (IFN-A) increases the antiproliferative influence of RA on MCL cells. Moreover, one isomer of retinoic acid, 9-cis-RA induced apoptosis, namely programmed cell death, when combined with interferon-A.

On the basis of the information gathered, particularly that of the synergistic action with interferon-A, clinical investigations were planned to further assess efficacy for pharmacological development.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4473

## Molecular markers for analysing the wheat genome

*Molecular markers were used to carry out a genetic analysis of bread wheat and identify the positions of quantitative trait loci (QTL).*

The use of molecular markers has significantly improved the ability of scientists to carry out genetic analyses of complex traits. It has allowed researchers to identify the QTL for yield in a number of cereal crops. QTL are stretches of DNA closely linked to the genes, which underlie a particular trait. The use of QTL analysis for quantitative traits in bread wheat is hindered, however, by the size of the genome. Therefore, a large number of markers are needed to map all the chromosomes. Furthermore, wheat is a relatively recently evolved species with a consequently low level of polymorphism.

This has meant that it has been difficult to produce detailed genetic maps for the entire genome compared to other crop species such as barley, rice and maize. A number of genetic maps featuring the whole hexaploid wheat genome are known, hexaploid organisms having six whole sets of chromosomes. The most detailed is the International Triticeae Mapping Initiative (ITMI) wheat map. In order to increase the level of polymorphism, a number maps were created by

crossing relatively distantly related parental lines. However, whole genome maps derived from crosses between cultivars or breeding lines are fewer in number.

The Sustain project used a bread wheat mapping population arising from a cross between the two hexaploid wheat (*Triticum aestivum*) genotypes. One of these, Chinese Spring, although unsuitable agronomically, has been well studied genetically. Therefore, many aneuploid stocks, that have an abnormal number of chromosomes, are available. These stocks were used to help allocate chromosomal locations to molecular markers.

The Sustain research team added an additional 38 markers to a final map featuring 449 loci. These were mainly simple sequence repeats (SSRs),

which are repetitive stretches of short sequences of DNA. Plant markers identified key traits for use in molecular screening to increase the efficient use of nitrogen in high-yielding varieties, reducing the amount of fertiliser farmers needed for their crops.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4693



## Blood grouping using the genetic approach

*Testing for donor and recipient compatibility for blood transfusions is usually based on serological testing. The EU-funded Bloodgen project has researched into genotyping blood groups for safety of individuals with rare blood group antigens.*

At present, most blood used in transfusions is typed serologically. This means that blood is not phenotyped for some rare clinically significant antigens. The consequences are that some individuals with rare blood genotypes can become alloimmunised with problems of compatibility if future transfusions are needed. Life threatening situations may

then arise, particularly for patients requiring multiple transfusions such as those suffering from sickle cell anaemia and haemophilia.

The answer to this problem is DNA-based genotyping. Unfortunately, it has not been economic or practical to genetically blood group every possible sample of blood for donation. The Bloodgen consortium therefore investigated means of genotyping all clinically significant blood types.

Molecular blood grouping experts across Europe joined forces to provide a platform for a series of high throughput blood genotyping tests. Project partners have constructed DNA chips or bloodchips based on DNA oligonucleotide microarrays. This approach was

combined with the real-time fluorescent polymerase chain reaction (PCR) assay. Together, screening for the large number of blood group alleles while typing for those with rare low-level alleles was made possible.

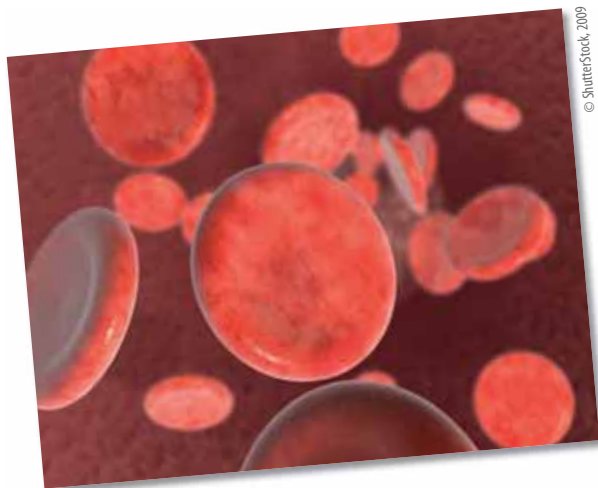
Pre-clinical trials were performed on patients throughout Europe with the aim of introducing molecular blood typing as a routine procedure. That way, safer, more reliable blood transfusion free of complication could be introduced.

Information has been disseminated through scientific publications, conferences and workshops. A bloodchip workshop was recently held at the University of West England in Bristol, United Kingdom. As well as detailed background to the technology, the course offered instruction and a hands-on approach to working with the genotyping DNA array. For those interested parties, the project website is: <http://www.bloodgen.com>

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; joint venture agreement; licence agreement; marketing agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4690



## Removal of amnesic shellfish poisoning contamination in scallops

*Sales of shellfish are enjoying a boom thanks mainly to their healthy image; but in order to keep this image they need to remain contamination-free. A method has been developed to remove algal toxins from scallops, providing a major benefit to consumers and all aspects of the shellfish supply chain.*

The Talisman project has discovered a simple, quick and cost-effective way of safely removing amnesic shellfish poisoning (ASP) toxins from scallops during processing. The result is scallops which meet safe end-product standards, even when heavily contaminated shellfish are fed into the process.

The toxins, which can build up within shellfish, are produced by microscopic algae called diatoms. If the toxins are accumulated in high enough concentrations they can affect humans when the scallops are consumed. Symptoms of amnesic shellfish poisoning include vomiting, nausea, abdominal cramps and bleeding of the lining of the stomach. More severe cases can result in headaches, dizziness, disturbed vision and short-term memory loss.

The new system takes away the risk of valuable scallops failing stringent safety standards, leading to destruction of the product and the resulting loss of income. The cost of

processing also needs to be borne in mind as does the possibility of product recall, all of which would be damaging to the industry. An outbreak of ASP affects not only fishermen and food manufacturers, but the whole supply chain including distributors, retailers and caterers.

The method for removing ASP contamination has been disseminated throughout Europe by project partners and organisations representing the industry. New quality control tools were also developed for ASP and paralytic shellfish poisoning

(PSP) contamination and applied to the processing activities. Scallops can now be processed all year round, despite high levels of ASP in the area of the fisheries. This has clear benefits for the shellfish industry.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4486



## Testing a new type of transformer

*Electric current measurement transformers are crucial to the generation, transmission and distribution of electrical energy and control the flow of power in any electrical grid. However, these vital pieces of equipment for measuring electrical magnitude are still manufactured using almost the same technological concepts and methods as 40 years ago.*

The IELAS consortium developed a new type of current measurement transformer, which operates using mechanical waves rather than magnetic flux variations. A full-scale prototype was produced, based on magnetostrictive and piezoelectric materials instead of copper coils and a magnetic core. Magnetostriction involves changes in the shape of ferromagnetic materials when subject to a magnetic field. Piezoelectricity is the ability of some materials to generate an electrical potential when mechanical stress is applied.

This new approach allowed researchers to significantly reduce the size and weight of the transformers and to stop using min-

eral oil for cooling and insulating the windings. These changes mean that manufacturing costs are dramatically lower than for an equivalent conventional current transformer. The industrial production of these devices would enable manufacturers to achieve a major competitive advantage and help boost the European economy.

Tests on the full-scale prototype were carried out in two phases. The initial phase characterised the sensor behaviour under different operating conditions of up to 3 000 A. It was concluded that further studies of the magnetostrictive material were needed in order to achieve repeatability of results. The electrotechnical design of the sensor ensured the stable alignment of the one metre stack. The stack comprised the magnetostrictive emitter, the piezoelectric receiver and the connecting alumina bar.

The second testing phase involved a series of standard high voltage tests. These are performed on all electrical equipment that is installed in an electrical substation and operated at the usual voltage ratios of up to 400 kV. The transformer successfully withstood the lightning impulse test and the power frequency test. These were necessary for ensuring that the integrity of the transformer's insulation was not compromised.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4663



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## Numerical code for noise generated by wind turbines

*Research undertaken in the context of the Fifth Framework Programme (FP5) helped narrow the gap between modelled and measured noise levels next to wind turbines.*

Wind turbines have a reputation for being noisy, but the Sirocco research consortium set out to change that. Measurements were performed to determine the sources of noise and then new blades were designed to be quieter without sacrificing energy production. Numerical code was instrumental in enabling this process.

The Energy Research Centre of the Netherlands (ECN) coordinated the project. They used a software package named Silant developed at Stork Product Engineering, the Dutch National Aerospace Laboratory (NLR) and the Netherlands Organisation for Applied Scientific Research (TNO).

Silant works by dividing the wind turbine blade into segments. The noise generated by

each individual segment is calculated and then summed over the entire blade. The Brooks, Pope and Marcolini model was employed for estimating trailing edge noise while the Amiet and Lowson approach was used for inflow noise.

ECN compared the sound power level calculated by Silant with measurement data collected by NLR. Adjustments were subsequently made to the numerical code of Silant where significant discrepancies between the modelled and measured val-

ues arose. The result of the Sirocco effort is a revised model that agrees well with actual noise levels.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4578



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## New transformers for voltage and current measurement

*The importance of controlling electricity flow has grown even higher in modern and complex power distribution networks. Aiming to address the challenges posed by the electricity market deregulation, an innovative approach to measure voltage and electric current has been adopted within the IELAS project.*

As communities grow and demand for electric power rises, it becomes necessary to carry electricity from electric power plants over longer distances at higher voltages, up to 765 000 V. Although such high voltage minimises electrical losses, it is impractical for distribution lines.

Instrument transformers, devices for voltage and electrical current measurements, are used to step down voltage, before dividing the flow of electricity between the multiple outgoing lines of local distribution systems. The IELAS project partners, funded under FP5, worked on alternatives to conventional inductive transformers.

Inductive transformers used for the measurement of electrical currents through high-voltage lines are not only large, heavy and expensive, but also carry a significant risk of explosion. The proposed system for electrical current measurements was based on the propagation of elastic waves through dielectric media.

Under the alternate magnetic field induced by the electrical current to be measured, the magnetostrictive material of the emitter generates elastic waves. Electrical signals of 50 or 60 Hz are converted into elastic waves that ultimately reach the receiver. The piezoelectric materials of the latter convert the elastic waves back into electrical currents that are amplified and processed through electric circuits.

A dramatic improvement in the magnetostriction properties of polycrystalline cobalt ferrite for use in the emitter was achieved at the laboratories of Materials Technology Department of Enterprise Ireland. Annealing cobalt ferrite in the presence of an external magnetic field of 9 kOe [kg of oil equivalent] and at a temperature of 150 °C induced a uniaxial anisotropy.

A coil of copper wire, consisting of more than 30 000 turns wrapped around the sample of polycrystalline material generated the magnetic field required for 72 hours. The sample was thermally insulated from extra heat loads from the copper coil by means of a jacketed tube machined from Ketron® Peek.

The crystals of cobalt ferrite after magnetic annealing were largely orientated towards the same direction, minimising the energy required to magnetise the polycrystalline material in this particular direction. Furthermore, the enhanced magnetostrictive properties of cobalt ferrite have proven that the approach adopted by the IELAS project partners will lead to a technology suitable for electrical current measurements.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4694



## Shouting for silent wind turbines

*One of the leading factors responsible for the reluctance to use wind turbines in Europe is the aerodynamic noise they generate. An EU-funded project, Sirocco, developed means whereby to identify noise source with the aim of finding solutions.*

Large wind turbines generate trailing-edge noise and it is this factor that has impeded their implementation in Europe, despite the fact that the pressures for their use have increased. What was therefore needed was a means by which noise source could be localised and then quantified.

Noise monitoring was conducted using a planar microphone array placed on the ground of about eight metres in diameter and carrying approximately 150 microphones. Using a standard directional signal transmission or reception process known as beamforming, the array is capable of localising the noise source in the rotor plane. By doing so, it could be determined whether a noise occurs in the nacelle or in the blades, for example.

Furthermore, an alternative processing technique was utilised that measured the revolu-

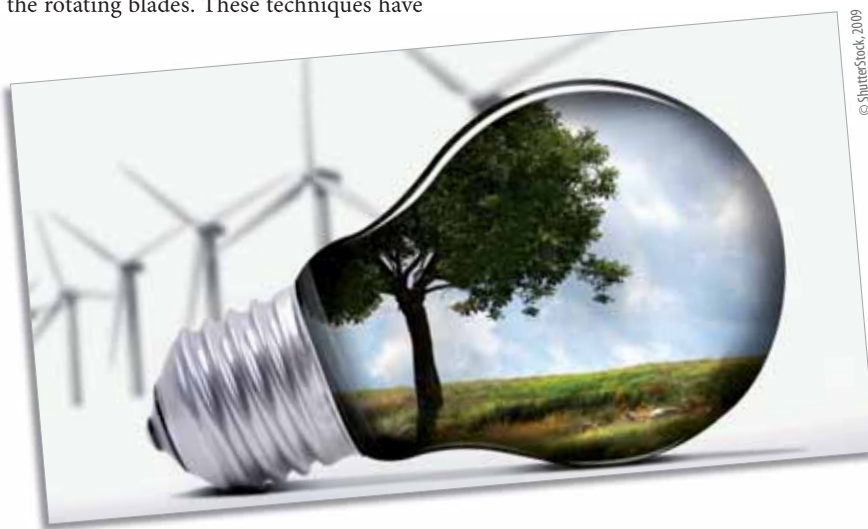
tions per minute through a trigger signal. By doing so the processing method can identify the noise of individual blades by localising and quantifying the dopplerised signal of the rotating blades. These techniques have

already produced improved signal to noise ratios and, with further research and development support, it might be possible to further silence these rotors.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4559



## Addressing ageing for long-term operation

*Knowledge of damage mechanisms that relate to ageing has been seen as among the necessary elements for making well-informed decisions on the lifetime management of nuclear power plants. The Vocalist project has advanced the development of fracture mechanics analysis models to a point where they may be used in safety assessments.*

The long-term operation of nuclear power plants is not influenced only by economic considerations such as operating costs or public acceptance. The availability of technical infrastructure and expertise to support systems, structures and components has been increasingly gaining the attention of the European Commission.

The Vocalist project was supported by FP5 to contribute to the development of a proper theoretical basis for the continuation of nuclear power plants' safe operation. The main research work of the project was to demonstrate that fracture toughness measured on test specimens is in any case covering the fracture toughness of postulated



cracks in real nuclear reactor components. In order to improve the defect assessment methodology, constraint effects on the fracture toughness of materials for nuclear reactor vessels were investigated.

Research at the laboratories of AREVA NP GmbH in Germany focused on the quantification of safety margins when testing and analysing constraint modified specimens and components. The pattern of crack tip stresses and strains causing fractures in real nuclear reactor components is different to that in standard test specimens. This phenomenon gives rise to the so-called constraint effects. To be of practical use, it was necessary to understand, quantify and validate the difference of toughness response to shallow cracks (low constraint) and deeper cracks (high constraint).

For this purpose, different models of the constraint effects were applied, including cleavage fracture models based on the calculations of the Weibull stress and T-stress around the crack tip. The results of material characterisation tests, when compared with model predictions, provided added confidence in their ability to adequately describe fracture toughness even for non-standard geometries.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4645

## Proper enforcement of the Low-voltage Directive

*Thanks to a collaborative research effort led by the University of Ljubljana in Slovenia, the EU's Low-voltage Directive will be enforced more effectively in potential EU Member States.*

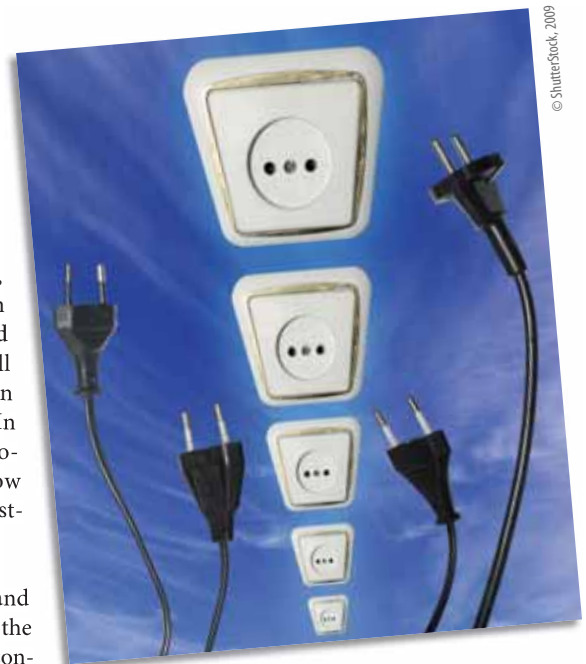
The enlargement of the EU brings with it many benefits, but also many challenges. Steps are taken prior to membership to ensure that potential members are on the right track with respect to adhering to European standards.

The LVD project is a prime example. Its objective was to help measurement and testing (M & T) laboratories in newly associated states (NAS) conform to the requirements of the EU's Low-voltage Directive. The project was coordinated by electrical engineers with the University of Ljubljana and involved partners from seven different countries.

M & T laboratories in several NAS were assessed, specifically their ability to evaluate overheating of electrical appliances using black test corners (BTCs). Unfortunately, large discrepancies between the BTCs of

the various countries were uncovered. In particular, there was significant variation with respect to BTC size and material characteristics as well as the number and position of sensors inside the BTC. In addition, the M & T laboratories studied did not all follow the same procedure when testing appliances.

The University of Ljubljana and its LVD partners recommend the creation of standards for the construction and use of BTCs, preferably by the International Electrotechnical Commission (IEC). This will help eliminate inconsistent results between M & T laboratories and avoid the unintentional release of potentially dangerous products to the marketplace.



Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4649

**See also page 43 (Testing chambers for wiring standards)**

## Semantic web promises a smarter electricity grid

*Dispersed wind farms and solar panels on people's homes are posing new challenges for managing power grids that were designed when all electricity was generated in centralised plants. A new semantic web technology promises a solution.*

Managing increasingly dispersed energy resources — from far-flung wind farms on remote mountaintops to racks of solar panels on suburban homes — is crucial if the electricity they produce is to be used as efficiently as possible.

Today, wind farms, solar and other renewable resources generate around 7 % of the EU's electricity, a figure that is set to rise to 20 % by 2020. But unlike conventional fossil fuel-burning or nuclear power plants, few of these dispersed energy generators feed information into grid management systems.

So grid operators cannot be sure what generators are connected, whether they are in operation and, if so, how much power they are producing. This could become a bigger problem, once these power sources start to account for a larger portion of Europe's energy supply.

'Grid management systems were designed around a large number of clients and a few suppliers, but now there are increasing numbers of suppliers. This requires a new level of communication and management system,' explains Bernhard Schowe-von der Brelie, a researcher at the FGH research institute in Mannheim, Germany.

Schowe-von der Brelie led a team of researchers who have made considerable progress towards developing a solution, not only for managing distributed resources in an electricity grid, but also for communicating with autonomous systems, devices and sensors across any network.

Working in the EU-funded S-TEN project, the team developed a generic framework for novel information and communication technologies (ICT) architectures and applied semantic web technologies to make networks self-describing so that each component — be it a voltmeter on a wind turbine or a thermometer on a weather station — autonomously publishes information about what it is, where it is, and what it does.

Because semantic data can be understood by machines as well as humans, the approach should lead to more efficient automated grid management and better decision support for human operators. Smart power grids, efficiently supplying a town or city from locally generated electricity and then feeding it into a wider supply network, could therefore be more easily and cost-effectively set up.

'Instead of storing information in a centralised database, the S-TEN approach is for each node, each sensor or device connected to the network, to have its own intelligence,' Schowe-von der Brelie says.

'The network, which can be accessed through a web interface, shows its current status — i.e. which objects are part of it and what they are currently doing. As well as providing monitoring and control of the network, this architecture can enable preventive maintenance strategies,' he notes.

The semantic web interface is built around the ontology web language (OWL) W3C standard, which allows applications to

interpret the meaning of information. In addition, the team developed the world's first converter between OWL and standard for the exchange of product data (STEP), a common format for expressing the design and functional aspects of a device.

'Our work on standards is a fundamental part of the



project, and will help ensure a future for the technology in different fields,' the project coordinator says. Managing distributed energy resources — the focus of two of four demonstrator applications developed by the project — is just one potential use for the technology, Schowe-von der Brelie notes.

Industrial equipment, embedded with sensors and chips storing and exchanging data, could alert technicians when they are due for maintenance checks or when a part needs to be replaced, thereby ensuring that factory downtime is kept to a minimum and safety risks are greatly reduced.

As highlighted in one of the S-TEN demonstrators, the machine itself could even provide the technician with updated maintenance guidelines extracted from information stored on the network.

Another demonstrator showed how the networked sensors and devices could be used to improve building standards — another essential means of improving energy use. By monitoring the power and heat consumption of homes, factories and offices, and correlating that data with information from nearby weather stations it would be possible to gain a clear understanding of the energy efficiency of different buildings.

It is likely that at least some of the project demonstrators will lead to commercial applications over the coming years, Schowe-von der Brelie says. Meanwhile, several of the project partners are looking to further their research through a new initiative under the European Commission's recent call for novel ICT solutions for smart electricity distribution networks.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90399>



## Conceptualising sustainable food supply chains

*Food supply initiatives across seven European countries were analysed highlighting their distinctiveness regarding their different dimensions and paths in order to create a conceptual framework for sustainability development and enhancement.*

Food quality and sustainable rural development are increasingly prevalent issues regarding the future of food and farming in Europe. In light of this, the Sus-chain project undertook the reconstruction of 14 vastly diverse food supply initiatives in seven European countries.

In the course of this analysis, it became evident that the distinctiveness of the initiatives is founded on three dimensions. These are governance, embedding and marketing. Governance relates to the structural and process-related aspects of a food network. Embedding involves the degree that a food network employs local resources as well as how societal norms and values factor into the food product and chain. Marketing refers to the business management of an enterprise or alliance.

These three dimensions are interrelated and interconnected and thus keeping them continuously coordinated and balanced is

crucial in regards to scaling up a food supply chain. The 14 cases exemplify their unique individual paths while simultaneously highlighting similarities and differences.

Through a detailed comparison of these similarities and differences, three main paths have been distinguished. These include chain innovation, chain differentiation and territorial embedding. Chain innovation involves the creation of a new food supply chain focusing on design development and implementation. Chain differentiation refers to the production and marketing of more distinct products having a significant difference to those already available in the existing chain. Territorial embedding is reconstructing a food supply chain to propel regional development and is driven by public or societal concerns regarding sustainable regional development.

Policy involves making choices that necessitate provision of effective support in all its forms including financial, marketing, information and public relations, advocacy, training and consulting, etc. The key issue therefore is how to go about providing the most effective and efficient support to meet the prevailing needs. The GEM framework offers increased awareness of development opportunities, constraints and risks encountered by different food supply chains in their various stages of development. In this way, particular types of paths having specific requirements can be assisted in improving their sustainability performance and thus in meeting their full potential.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; private-public partnership; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4673



## Delivering sensors to deep geological repositories

*The SOMOS project sought to deliver a reliable solution for long-term monitoring of nuclear waste repositories. Belgian research institutes have played an important role in the evaluation of deep geological repositories as a viable option for storing spent nuclear fuel.*

Working with Euratom funding, the Fibre Optic Sensing Research Centre in Belgium attempted to transfer expertise in optical fibre telecommunications applications to repository monitoring.

The work took place at the HADES underground research laboratory, which was constructed by the Belgian Nuclear Research Centre. The idea behind the SOMOS

project was to develop optical fibre-based temperature and radiation sensors and distribute them to a repository via capillary tubes.

Stainless steel tubes installed at HADES during the Coralus project were used to test the feasibility of the SOMOS concept. The geometry of the Coralus tubes proved extremely challenging, but temperature

sensors based on carbon-reinforced Tower grating fibres were successfully deployed. However, further research is necessary in order to reach the same milestone for the more fragile radiation sensors.

The Fibre Optic Sensing Research Centre and its SOMOS partners are following up on these positive results.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: financial support.

<http://cordis.europa.eu/marketplace> > search > offers > 4621

**See also page 31 (Effect of excavating a gallery in Boom clay)**

## Reclaiming strategies for wastelands

*Mining and other industrial activities have created ecological wastelands in the form of landfills and dumps. An EU-funded project, Reintro, investigated strategies to reclaim these wastelands and to use the resulting materials for ceramic production.*

To do so, a consortium was founded comprising engineers, geologists, biologists, material scientists and manufacturers of ceramic products. One of their main ob-

jectives was the assessment of the financial possibilities of land reclamation and ceramic production techniques. As a first step, they assessed the waste situation, identifying any special needs such as the requirements for wastewater treatments. Furthermore, they conducted parallel studies to identify the various products they were to deal with.

In assessing many sites across the Balkan states, it was identified that there were common problems. These pertained to the accumulated industrial wastes, tailing, slag and contaminated industrial sites. In Bosnia-Herzegovina for example, 15 dump sites were investigated in relation to their reclamation potential as well as their availability of waste material suitable for ceramic production. Eleven fly ashes and seven types of slags were characterised both for thermochemical and chemical properties.

As an additional aspect of the research, the project conducted field reclamation tests by

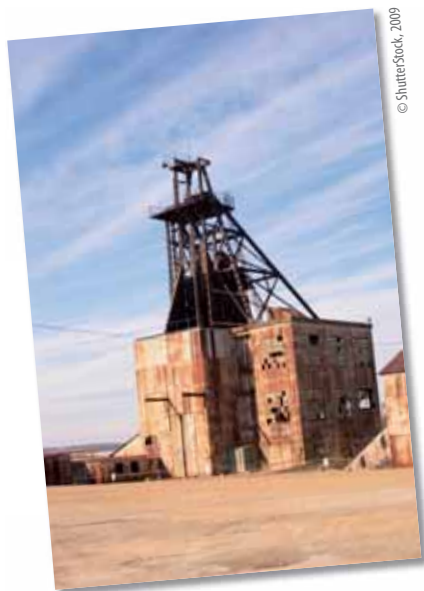
planting a reclaimed dump site with specific vegetation. Alfalfa, grass and Robinia were most widely used, as this combination was shown to produce the best results. Moreover, the presence of heavy metals in their root, body and leaf systems were shown to be well below the maximum allowance for contamination levels.

Aside from the wide and numerous publications of the project's results, further achievements can be seen in the ceramic tiles produced. Dense ceramic tiles manufactured as a result of the project provide corrosion resistance to chemical and biological factors. Additionally, they are highly suitable for applications associated with piping in chemically corrosive soils. They can also be used in ports and harbours, and in a number of industries such as for flooring for fertiliser factories. Finally, a production factory for the tiles was established.

Funded under the FP5 programme 'INCO 2' (Confirming the international role of Community research).

Collaboration sought: joint venture agreement; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4624



## Measuring the quieter side of water vehicles

*Sound or noise pollution has been the focus of many directives of the European Commission. An EU-funded research project, Soundboat, has now looked into making water recreational vehicles more compliant with these directives.*

The boom and din of high-speed boats can be heard from vast distances. While some might enjoy the crashing sound, they nevertheless are noise pollutants, disrupting both marine life and the quality of life for others. Investigating means by which on-board measurements can be taken to reduce noise levels was of primary concern for a consortium of researchers.

Their goal was to develop a single, robust method in which compliance to the directives relating to sound levels could be certified. In doing so, they developed a test prototype called SoundBoom. The device allows for the prediction of a vessel's compliance as it passes by. The measurements are taken on board by an on-board boom. This boom is an extended pole having a power supply and amplifier within the boom handle. The microphone is wind-shield fitted for more accurate readings and the whole thing is connected to a standard laptop computer via a USB device.

The project investigated five sound measurements taken at selected positions on the boat

which are analysed in real time. One of the major developments of the research was its predictive algorithm. This two-part algorithm provides both a predictive measurement of the sound levels whilst the second part provides an empirical method for exhaust noise levels. Another achievement was to identify

key parameters of boat noise. A third was in identifying suitable measures and equipment needed to measure noise levels. Further activity in the project will now look at getting the method accepted for certification.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: manufacturing agreement; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4577



## Benefits of inoculating trees with microsymbionts

*Finding firewood for cooking and other household needs and providing fodder for domestic animals are major issues in sub-Saharan Africa. The Ubenefit project has supported sustainable development in the region by investigating the benefits of inoculating a range of tree species with microsymbionts.*

The Ubenefit project aimed to improve fuel wood and leaf fodder supply in sub-Saharan Africa. This work contributed to the United Nations' Millennium Development Goals. Growing trees that could maximise either fodder or fuel production helps to reduce deforestation and land degradation, and improves living conditions for the local population. Researchers studied the beneficial effects on a number of tree species following inoculation with mycorrhizal fungi and Rhizobium bacteria.

A mycorrhiza is a mutually beneficial relationship between a fungus and the roots of a plant. Rhizobia are soil bacteria found in the root

nodules of some plants, which take atmospheric nitrogen and convert it into different nitrogen compounds. The double inoculation by the Ubenefit team had a positive effect on plant production. The result for inoculated species was 67 % greater for firewood compared to the control, and 35 % for fodder.

Screening experiments showed that the Australian tree *Acacia mangium* was the best adapted and best performing species out of all the Australian trees studied. The species *Acacia angustissima*, from Central America and the United States was found to require a lot of water compared to other species. Although this tree was found to be the

least adapted to a semi-arid environment, it would be suitable in relatively humid areas because it produces a lot of biomass.

The amount of water contained in the soil was found to be the same for the different species being studied although it did vary according to depth. There was a decrease in soil water content from the surface to 30 cm depth. Deeper layers in the soil profile showed higher water content.

According to interviews undertaken by Ubenefit researchers, 90 % of local women stated that the Mexican tree species *Leucaena leucocephala* was a good option for using as fuel. This compared with 40 % of the respondents who identified *Acacia angustissima* as a good fuel wood.

Funded under the FP5 programme 'INCO 2' (Confirming the international role of Community research).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4644

## Effect of Atlantic water on the Arctic Ocean

*The climate of north-west Europe is warmer than would be expected given its latitude. This is a result of a range of oceanic processes, which take place in the nordic seas and the Arctic.*

A key question arising from climate research in the Arctic was whether heat carried by oceanic currents can influence the formation of sea ice. A further question has been whether an increase in oceanic heat can reduce the level of ice cover. The ASOF-N project has investigated possible changes in the region as a result of climate change. Researchers studied the inflow of warmer water from the Atlantic into the Arctic Ocean.

Scientists from ASOF-N also measured the outflow of sea ice and the export of fresh water from the Arctic Ocean to the nordic seas through Fram Strait. Fram Strait has a depth of 2 600 m and is the only deep passage connecting the Arctic Ocean to the rest of the world ocean. For this reason, researchers calculated the level of exchange of inter-

mediate and deep waters occurring between the Arctic Ocean and the nordic seas.

Measurements taken in Fram Strait indicated that pulses of warmer Atlantic water passed through the strait adding their heat to the Arctic Ocean. The Atlantic water also provides the main input of volume, salt and heat to the Arctic Ocean. This was ten times greater than the inflow of Pacific water through the Bering Strait. However, not all the water entering through the Fram Strait is from the Atlantic. It can also include intermediate and deep waters, or result from water being recirculated in or just to the north of the strait itself.

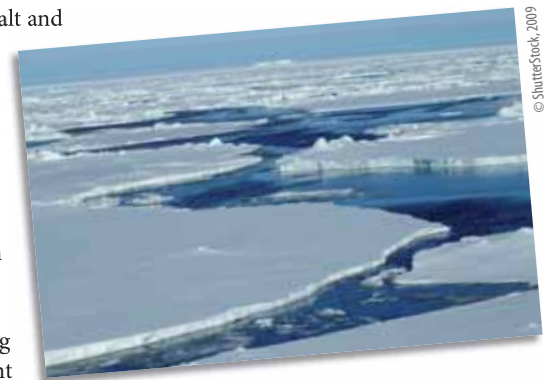
The length of time that the circulating water resides in the ocean's different

basins varies; heat entering the Arctic Ocean becomes dissipated over time and space. The water just north of the Fram Strait can take one year to circulate, while that passing through the remote Canada basin can take 20-30 years.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4647



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## Bread wheat with low fertiliser requirements

*Research during the Sustain project will help reduce the amount of chemical fertiliser needed to produce bread wheat. The application of nitrogen as a fertiliser has helped substantially increase crop yields, but it has also polluted and threatened the health of our ecosystems.*

Rothamsted Research, a leader in agricultural research in the United Kingdom, coordinated a project aiming to develop a strain of bread wheat more efficient at absorbing nitrogen.

The scientists used genetic analysis to identify specific regions on the plant's chromosomes, known as loci, associated with the genes that drive nitrogen utilisation. The work was the first of its kind for bread wheat.

They discovered that the enzyme glutamine synthetase (GS) plays a key role in the process. This finding was later confirmed by field trials. In addition, cooperation was established with complementary research efforts dedicated to near isogenic line (NIL) production.

Rothamsted Research and its partners will use marker-assisted selection (MAS)

continued on page 27

## New tool takes guesswork out of stormwater management

*An online catalogue has been developed to enable practitioners and urban architects to choose the most appropriate and cost-effective management system for pollution caused by stormwater. This new online facility enables accurate planning so as to avoid risks to public safety and damage to public and private property.*

The Daywater project has been set up to examine stormwater pollution control. As an extension to this study, scientists at Middlesex University in the United Kingdom have collaborated to provide a best management practice catalogue. The aim of this online service is to offer a support tool to assist end-users on stormwater management practices.

The online tool provides a database with detailed information on 15 structural best management practices (BMP), such as infiltration systems, ponds, basins and permeable surfaces. It also gives useful guidelines and information on 5 non-structural BMPs including snow management and cleaning practices.

The assistance it provides has been designed to adapt to the individual user's level of expertise on the subject. It provides a comprehensive description of a variety

of system types, designs and modes of operation.

It has many potential users, such as landscape architects who are responsible for incorporating urban drainage systems into their designs of new or existing developments. For these practitioners, the catalogue provides clear information on both BMP performance and operation as well as on maintenance requirements. Landscape architects can compare the costs associated with different drainage options and can access photographs of real-life examples of systems already in use in Europe.

The database can also be used to compare particular differences between structural and non-structural systems. This can indicate to the practitioner when there is a strong



practical advantage to using one system over the other. It is expected that this will be an indispensable tool to those involved with urban stormwater management.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

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## Project message reaches its audience

*Past climate change has had momentous effects on human societies. Important findings of the Accrotelm project may help in preparing adaptation strategies for future climate change. Communicating these strategies to a broader audience is an important step toward this goal.*

The Accrotelm project focused on abrupt climate change, encompassing the careful research of 10 partners from institutions across Europe. Scientists used new data to make an assessment on climate variability across Europe over the past 6 000 years and the findings are to be used to inform EU policy.

In order to achieve their goal of information dissemination, parts of the project's resources went towards developing an effective communication strategy. This has produced some interesting results.

A publicly accessible website has been designed. It details the aims, methods

and the protocols developed throughout the project. It provides public access on the project partners and gives a cumulative list of publications associated with the results.

Eight posters were produced for the 2006 Holivar international science meeting. These drew attention to the aims of the project and promoted the project website. One of the posters won a Holivar prize. This poster can be downloaded at <http://www2.glos.ac.uk/accrotelm/holipost.html>

In order to expose interested parties to the project, it is planned that the major findings

be circulated via targeted press releases. These will be placed on the European science website AlphaGalileo.

It is also in the plans of the organisers to archive datasets from the project on the Pangaea database, so that they can be accessed for future scientific studies.

In addition to all this, a film about the project has been made and reproduced on DVD. It sets the work and results amid the context of the current concern over recent and future climate changes.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

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continued from page 26 **'Bread wheat with low fertiliser requirements'**

to exploit the knowledge acquired during Sustain to selectively breed bread wheat with high nitrogen utilisation. The procedure can also potentially be extended to identify and elicit other advantageous traits.

Finally, other major food crops, such as maize and rice, are also prime candidates for similar studies. This will lead to further reductions in the application of artificial fertilisers and the negative impacts associated with this practice.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

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## Accurate measurement of boron isotopes in foraminifera

*The relationship between changing oceanic carbon cycles and their influence on atmospheric changes has been the subject of much research. An EU-funded project, 6C, sought to investigate the use of a novel mass spectrometer to measure boron isotope levels in order to elucidate the significance of atmospheric carbon dioxide (CO<sub>2</sub>) levels.*

Boron isotope studies in core samples can account for the observed changes in atmospheric CO<sub>2</sub> in glacial and interglacial periods. This in turn will help to identify natural sources and sinks of CO<sub>2</sub>. In order to measure trace element isotope levels and apply

numerical modelling, project partners from Universität Münster in Germany measured boron isotope levels in foraminifer (marine protozoa) shells from a core study.

In order to acquire high-precision isotope ratio measurements, the team used a resonant laser secondary neutral mass spectrometer (r-laser-SNMS). The laser is a highly focused (50 nm in diameter) energetic ionic beam for bombarding the solid sample used in conjunction with a time-of-flight (ToF) mass spectrometer to analyse the sputtered particles.

Since energy spectrums of discrete excited states for each element are unique, resonant multiphoton post-ionisation (RMPI) analysis is extremely valuable in high-precision detection of ultra-trace elements in complex samples. As r-laser-SNMS ionises the majority of sputtered neutral boron atoms which are less affected by the surface properties, this leads to greater accuracy of measurement.



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## Index provides insight into global carbon cycle

*The Netherlands Institute for Sea Research (NIOZ) has discovered a very useful biomarker for palaeoclimatologists and palaeoceanographers looking to reconstruct the past from sediment cores.*

Understanding natural variability in the global carbon cycle in the past can help us better interpret the variability occurring today, including the impact of anthropogenic emissions of carbon dioxide (CO<sub>2</sub>). The NIOZ extended upon previous research using core samples from the ocean floor to shed light on carbon cycling during the Quaternary period.

The 6C project, targeted organic material transported by icebergs. The institute scientists looked beyond traditional carbon indices, such as total organic carbon (TOC) and the relative measurement of the proportion of C13 to C12, d13C of TOC (d13Corg), to glycerol dialkyl glycerol tetraethers (GDGTs).

Sediment cores from the floor of the Atlantic Ocean were analysed for GDGTs stretching back 30 000 years before present. They focused on branched GDGTs and crenar-

chaeol, a marine isoprenoid GDGT, which they combined into a branched isoprenoid tetraether (BIT) index.

The BIT index compared well with d13Corg indications of elevated organic transport via ice rafting. These phenomena, known as the Heinrich events, were more prevalent during glacial periods, though significant variation was evident during the rapid changes in the Earth's climate. Carbon dating also confirmed the existence of older than expected materials in the deposits.

Further to the encouraging results with the BIT index, NIOZ and its 6C

One of the innovations behind the study was the optimisation of experimental conditions that ensured a steady and high boron neutrals flux from the calcite surface of the shells. To achieve this, the r-laser-SNMS analyses were performed with various boron concentrations under differing analysis conditions. To further increase the accuracy of data, several other modifications could be implemented. These include increasing the analysis time and number of repetition rates of the analysis cycle. The use of a high-current ion gun would also increase the primary ion current.

The advantages of the r-Laser include those of excellent sensitivity, efficiency and selectivity, together with reduced fractionation and matrix effects. Furthermore, integrating the RMPI with ToF mass spectrometry allows for performing imaging of nanostructures where ultra-trace elements can be detected and quantified by r-laser-SNMS. Looking to other fields, the development can be used in biomedical, geological and chemical fields. Overall, the technology can be applied where analysis and resolution are required at the nanometre level.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support; financial support; information exchange/training; available for consultancy.

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partners published articles in relevant scientific journals. Efforts were also planned to use the index to quantify carbon transfer prior to the Quaternary period.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support; financial support; information exchange/training.

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## Finding the best carrier for titanium dioxide

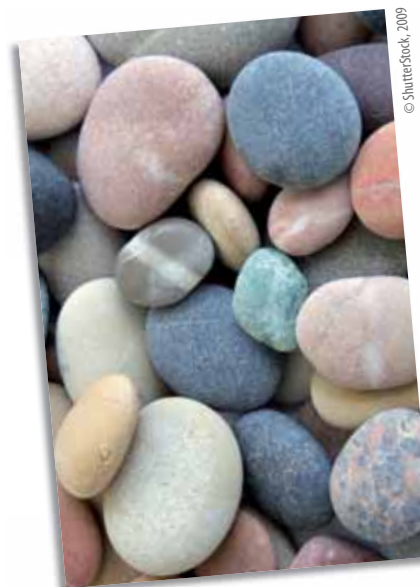
*Research funded by FP5 has highlighted the most promising carriers for photocatalysts used in a novel water purification system. Remote regions where electricity is not available often suffer from a lack of clean drinking water. Solar-powered solutions offer hope, but several technical challenges remain.*

In the context of the Solwater project, an effort was made to improve performance by introducing a titanium dioxide (TiO<sub>2</sub>) photocatalyst in a variety of formats. The experiments were led by the Universidad Nacional de Ingeniería in Peru. Significant resources were dedicated to perfecting the TiO<sub>2</sub> deposition process for glass Rashig rings and the growth of zinc oxide films, but the greatest potential was identified for ceramic beads and activated carbon.

In order to ensure the stability of the photocatalyst, the coated ceramic beads were subjected to turbulent flows corresponding to Reynolds (Re) numbers from 100 to 400.

Fortunately very little deterioration was detected and removal rates of 4-chlorophenol and other highly toxic compounds were undiminished in comparison with unwashed beads.

Encouraging results were also obtained depositing TiO<sub>2</sub> on activated carbon using the sol-gel technique. Analyses with a scanning electron microscope and other equipment indicated good surface characteristics. Tests with artificially contaminated water revealed adequate removal of 20 ppm of phenol. A further benefit of the activated carbon option was the ability to tailor the pellet size and porosity to the application.



Funded under the FP5 programme 'INCO 2' (Confirming the international role of Community research).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

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## Understanding how trees respond to increased carbon dioxide

*It is hoped that the Earth's forests may be able to absorb some of the excess carbon dioxide (CO<sub>2</sub>) mankind is pumping into the atmosphere. New research put this hypothesis to the test.*

While it is well known that the concentration of CO<sub>2</sub> in the atmosphere is rising, it is not well known what effects this is going to have on ecosystems. Forests, for example, store significant amounts of carbon, but knowledge concerning possible CO<sub>2</sub> fertilisation effects is limited.

The Euroface project brought free-air CO<sub>2</sub> enrichment (FACE) technology to European poplar stands. The concentration of CO<sub>2</sub> was artificially elevated both above

and below ground. Measurements of tree growth over a period of three growing seasons were recorded and compared against plots treated with conventional fertilisers and control plots.

The data was then formatted and fed to the 'Analysis of forest ecosystems' (Anafore) model by biologists with the University of Antwerp in Belgium. They found that the model was able to successfully reproduce the substantial increase in carbon seques-

tration not only in the leaves and branches, but also in the soil. In contrast, there were no signs of enhanced growth on the fertilised plots.

While these results demonstrate the potential for increased carbon uptake by the world's largest carbon sink, forests, there was evidence of possible saturation by the third growing season. For this reason, the University of Antwerp and its Euroface partners advocate continued monitoring for several additional growing periods.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

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## Carbon sequestration in experimental studies

*Understanding the impact of climate change on ecosystems around us is heavily dependent on the recreation of the desired environmental conditions needed for experiments.*

The EU-funded Euroface project concentrated on the role of forest plantations to reduce greenhouse gases. The hypotheses put forward by partners were tested using a technology termed free-air carbon dioxide (CO<sub>2</sub>) enrichment (FACE) used to expose specific predefined open-air areas to elevated levels of CO<sub>2</sub> without altering overall climatic conditions in the test areas.

The use of FACE technology allows scientists to measure and monitor the effects of elevated

CO<sub>2</sub> levels in the ecosystem. A research team from the University of Wales focused on the use of short-rotation forestry (SRF) plantations in order to evaluate their long-term potential in carbon sequestration.

The studies showed that increasing the levels of CO<sub>2</sub> in the region resulted in an increase in carbon levels below ground as expected. Extension of the research would be to follow the path of the stored carbon and how this will affect overall balance of the sur-

rounding system. It is already known that increased CO<sub>2</sub> can result in direct increases in the volume of the root system.

Understanding the entire scope and interdependencies of events that emanate from increases in atmospheric CO<sub>2</sub> is currently the topic of intense research globally. The importance of the experimental parameters is therefore extremely high and further research can aid scientists construct the correct experimental framework.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

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## Preventing regrowth of bacteria in solar reactors

*Researchers developed low-cost solar technologies for supplying clean drinking water to isolated communities in developing countries to combat waterborne diseases.*

The aim of the Solwater project was to provide safe clean drinking water, free from contamination by micro-organisms. Researchers developed a low-cost fully autonomous solar reactor system for purifying drinking water in remote locations. The disinfection of water by photocatalysis was successfully achieved through the use of titanium dioxide (TiO<sub>2</sub>) and ruthenium complexes.

However, this research did not only involve the concentration of micro-organisms following photo-assisted disinfection. Following treatment, the water can be free from coliform bacteria, which are often used as an indicator for water quality.

It also took into account the possible regrowth of microbes following exposure to light due to the lack of effectiveness of the disinfection process. The ability of cells to repair themselves in the dark following exposure to sunlight also needed to be considered.

For this reason, the total disinfection of treated water had to be ensured by regrowth controls and kept in the dark for a certain time following treatment. This was especially true in the case of heterotrophic bacteria such as *Pseudomonas aeruginosa*, which have been detected in photocatalytically treated water at concentrations higher than the initial count.

This population increase could be due to the rise in temperature which can encourage the growth of biofilms in the unlit parts of the bioreactor. A biofilm is an aggregation of micro-organisms covered with a polymer

matrix. The heterotrophic bacteria were successfully eliminated by placing the disinfected water in plastic bottles fully exposed to sunlight in the presence of TiO<sub>2</sub> immobilised on glass.

Funded under the FP5 programme 'INCO 2' (Confirming the international role of Community research).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

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## Time to reassess responses to stormwater pollution

*It is generally presumed that devices that are employed to deal with pollution caused by stormwater are effective in all cases. This new research shows that this is not true and that public authorities would do well to refer to this study which shows how each type of device responds to each of the most damaging pollutants.*

Stormwater management is an increasingly important issue for economic, social and environmental reasons. Stormwaters carry pollutants downstream to waters we rely on for our wellbeing. Economically, we pay a hefty price as taxpayers when things go wrong because of stormwater. If stormwater

is mismanaged, public and private property can be damaged as a result of erosion and flooding.

This research, which has been carried out by scientists at Middlesex University in London for the Daywater project, contributes to our understanding of how stormwater effects our environment. This can help decision-makers take the necessary precautions to minimise this pollution.

A 41-page report entitled *Determination of numerical values for the assessment of*

BMPs was put together. It scales the effectiveness of best management practices (BMPs) that can include devices which are designed and constructed to trap or filter pollutants from runoff water or to reduce runoff velocities. It assesses these devices according to tests done on different pollutant types.

The report describes the biological, chemical and physical processes which can contribute to the removal of pollutants. These processes were divided into direct and indirect mechanisms. Direct processes include absorption, biodegradation, filtration and photolysis. Indirect, describes the processes which occur as precursors to direct removal and includes adsorption to suspended solids.

The research found there to be clear evidence of differences in how BMPs respond to different pollutant types. Infiltration basin and sub-surface flow constructed wetlands were predicted to have the highest pollutant removal effectiveness. Settlement tanks consistently performed least well in the tests.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

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## Effect of excavating a gallery in Boom clay

*Deep clay formations were examined as a possible repository for radioactive waste. Studies were undertaken to determine the proliferation of fractures and the self-healing properties of the material following the excavation of a gallery.*

Countries that generate high-level and long-lived radioactive waste require a secure environment where it can be safely disposed of. One of the best options is for it to be stored underground in deep clay geological formations.

A crucial feature for long-term safety is a comprehensive study of the excavation damaged zone (EDZ). The EDZ is the modified zone which might experience negative effects on safety due to the building, operation and closure of the radioactive waste repository. The Selfrac project carried out studies into the suitability of Boom clay for holding radioactive waste. The work was carried out at the HADES underground laboratory in Belgium.

Studies were carried out into the hydro-mechanical properties of the area around the EDZ three years after its initial construction. Two multi piezometers were fitted around the connecting gallery which provided data on how flow properties changed over time.

Self-boring pressuremeter tests were undertaken to investigate changes in mechanical properties. The results indicated that the construction of a gallery in Boom clay at a depth of 223 m would always cause fractures. The fractures were created by stress distribution, which resulted from tunnelling. However, the extent of fracture could be limited through using the correct excavation and tunnelling techniques. It was shown that although such fractures could be sealed, they only partially healed.

According to the investigation, hydraulic conductivity around the gallery did not appear to be affected by fractures. Furthermore, any existing interconnected fracture network went no deeper than a few tens of centimetres into the host rock.

Changes in k-values gave an indication of how the clay had been deformed over time. Pore pressure was influenced to a large extent by the existence of the gallery. Pore pressure distribution differed according to the direction in which the measurements



were taken. This was due to stress and the hydraulic conductivity of the rock.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: information exchange/training.

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**See also page 24 (Delivering sensors to deep geological repositories)**

## Intelligent spraying reduces pesticide application

*The introduction of advanced technological solutions to the age-old industry of agriculture can boost efficiency and lead to substantial environmental benefits.*

Application of agrochemicals is a necessary evil of modern agriculture. However, there is considerable room for improvement in today's methods. A group of 10 research organisations collaborated during the Precispay project to bring the power of information technology to orchard management.

Hardi International AS, a Precispay participant boasting comprehensive experience in spraying applications, helped guide the development of an intelligent robotic sprayer. The sprayer is driven by tree position and volume (TPV) data, which is acquired by a digital aerial photography system created during the project. Images

are captured, processed, stored and subsequently retrieved by an 'Orchard management geographic information system' (OM-GIS).

The OM-GIS interface allows its users to access a knowledge-based crop protection A 'Decision support system' (DSS) draws upon infestation records, spraying history as well as a variety of geographical, textual and numerical data. The OM-GIS controls the guidance system of the robotic sprayer, optimising agrochemical delivery from its sprayer arms according to tree shape and volume.

Trials during Precispay revealed that the amount of pesticide applied could be reduced by as much as 36 % without negatively impacting its effectiveness. Future modifications of the aerial TPV system could result in additional savings. Finally, the OM-GIS can also be used as a stand-alone product with conventional spraying equipment.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4667



## Analysis of bottom-dwelling fish communities

*Bottom trawling in the North Sea has an impact not only on the target species, but on the whole ecosystem. The Mafcons project developed management protocols that would minimise the ecological impact of commercial fishing in the region.*

Commercial fishing in marine ecosystems can result in substantial mortality among non-target fish species and bottom-living marine invertebrates. Therefore, an ecosystem based approach needs to be taken towards managing fisheries, resulting in

sustainable usage and the conservation of biological diversity.

The Mafcons project developed a management protocol for predicting the consequences of setting a particular total allowable catch (TAC) on the diversity of bottom-dwelling fish species. The development and testing of a theoretical ecological model was achieved, which underpinned the entire protocol. The model required a sound understanding of ecological theory and how different fishing activities affected marine ecosystems.

Researchers created mathematical algorithms that allowed fisheries scientists to determine the effect TAC has on

the marine ecosystem, including bottom-dwelling invertebrates and non-target species. The effect of a particular type of fishing gear could also be determined. The catchability of the gear can significantly affect maps of biomass density and production.

The information gained allowed TACs to be set which minimise the ecological impact of commercial bottom trawling in the North Sea. The Mafcons team used standardised sampling methodology to arrive at statistics that gave a true reflection of the actual biological diversity.

Results suggested that diversity was highest in the southern North Sea which is shallower and more productive. When catchability was taken into account the northern region showed greater species richness and species diversity of the targeted fish species. However, when based on raw data for abundance, diversity appeared greatest in the south-eastern sector of the North Sea.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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## Photosensitisers enhance singlet oxygen production

*Providing safe drinking water to remote regions could help save innumerable human lives. Fortunately, researchers in Spain found a way to boost the performance of a water purification unit powered by the Sun.*

Nine organisations from three different continents teamed up during the Solwater project. The group focused on singlet oxygen, a reactive species with advantageous physiochemical characteristics that enable it to cleanse contaminated water of potentially deadly microorganisms.

Work led by the Universidad Complutense de Madrid examined the effectiveness of various photosensitisers, substances that enhance singlet oxygen formation via photocatalysis. Specifically, a number of polya-zaheterocyclic ruthenium (Ru) compounds were tested on samples containing high concentrations of two well-known bacteria: *Escherichia coli* (*E. coli*) and *Enterococcus faecalis* (*E. faecalis*).

The experiments revealed that none of the Ru complexes were effective in the absence of light. On the other hand, bacterial con-

centrations started dipping when radiation in the visible spectrum was introduced. Furthermore, when the tests were performed in the homogeneous phase, the cationic RDP2+ photosensitiser dramatically reduced the amount of *E. coli* by two orders of magnitude.

The anionic Ru complex, RSD4-, had less of an impact, managing just a 15 % reduction in *E. coli* numbers. This is likely to be due to the fact that the bacteria's membrane also carries a negative charge, thus its interaction with RSD4- is not aided by electrostatic attraction as in the case of RDP2+.

The Solwater consortium used this knowledge to improve the design of its prototype water decontamination unit.



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Funded under the FP5 programme 'INCO 2' (Confirming the international role of Community research).

Collaboration sought: further research or development support; manufacturing agreement; financial support; information exchange/training; private-public partnership; available for consultancy.

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## Virtual games as rehabilitation in rural areas

*Virtual reality (VR) techniques provide a useful and effective method for rehabilitation of patients; this is particularly useful in overcoming barriers to access experienced by those who live in rural areas. Researchers have now designed the most effective virtual games for this purpose.*

The number of patients needing rehabilitation (including long-term therapy) has increased in recent years, but available resources have unfortunately diminished. If therapy is not adequate, be it because of the lack of its duration or lack of appropriate methodologies, this can lead to permanent disabilities in otherwise reversible conditions.

For those who live in remote rural locations or those living in depressed urban areas, access to appropriate rehabilitation methods is often not possible. In many of these instances there are no clinics in the vicinity of the patient's home.

The Teledoc project aimed to address this problem by developing a complete system for tele-rehabilitation making use of VR tech-

niques. It creates an environment in which various training functions such as intensity levels, can be manipulated and enhanced.

Other advantages of using VR in the rehabilitation process include the ability to make training engaging, which is important for patient motivation. Furthermore, sensor technology can be adapted so that it can be used to quantify progress made by the patient, especially when assessing motor control improvement.

The Teledoc project designed a fully operative system demonstrator for this purpose. It includes a haptic interface developed for upper-limb rehabilitation. It is formed by two joysticks or motion systems: a spherical system designed for the wrist and an X-Y table designed for elbow and shoulder.



As part of the project, 10 different video games were developed, of which three were chosen to be integrated into the rehabilitation device. These were entitled *Ping-pong*, *Labyrinth* and *Fisherman*. A short introductory video was also produced to explain how to use the system. The design and research team found that because the target population are from rural areas, the simple videogames were the most effective for the rehabilitation process.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; licence agreement; marketing agreement; private-public partnership; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4660

## Integrated rehabilitation for disabled patients

*A novel tele-rehabilitation system has been designed which connects a pair of PCs assisting in providing home rehabilitation to patients with disabilities.*

Patients in need of therapy due to a disability are often subject to spending time in a recovery facility away from their home and loved ones. The Teledoc project has found a way to overcome this by connecting a home or satellite centre with a clinic or assistance centre. This is done with the pairing of PCs from each site and the use of internet or a local network.

The system is composed of a number of subsystems. These include a haptic device, a virtual reality (VR)-based tele-rehabilitation application, a multipurpose control interface and a database. The haptic device functions

in two modes and is used for the upper limb such as the wrist, elbow and shoulder.

Additionally, the haptic device has a screen so that the patient may watch and play video games which have an adjustable range of movement and speed to fit the patient's needs. There is no need for reprogramming each time a device is plugged in thanks to the multipurpose control interface. Finally the database can store the patient's exercise data and assess the patient's progress.



Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; licence agreement; marketing agreement; private-public partnership; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4686

## Robust watermarking offers hope against digital piracy

*Watermarks have been used for centuries to prove the authenticity of bank notes, postage stamps and documents. Now European researchers are considering them as a new tool in the fight against digital piracy and to authenticate and verify the integrity of digital media.*

With millions of illegally copied songs and videos winging their way across file-sharing networks, artists and producers have been sent scrambling for ways to protect their content. Digital rights management (DRM) systems that prevent copying have raised fair-use issues however, because they not only block pirates but also prevent legitimate consumers from making back-up copies.

Watermarking, in contrast, does not prevent copying, but depending on the application, can let consumers and producers know what content is authentic and what is fake, and can help authorities trace illegal copies.

'I foresee watermarking playing a very important role in protecting digital rights, a growing industry because of piracy,' says Bart Preneel, a professor at Katholieke Universiteit Leuven in Belgium. Other uses, he notes, include authenticating information and ensuring data integrity, as well as making content easier to identify and find.

Preneel coordinated the EU-funded Ecrypt project, which set up a network of researchers across Europe to deepen research into cryptography, and, through one so-called 'virtual lab' called Wavila, to study methods and applications for digital watermarking and perceptual hashing.

Though not a new concept, digital watermarking is starting to gain favour among content producers as one of several emerging

anti-piracy measures. Earlier in 2008, for example, record companies Sony and Universal started embedding anonymous watermarks into songs not protected by other DRM methods. That will allow them to trace the origins of illegally copied material, potentially generating important empirical evidence on the scale of the piracy problem as they seek tighter copyright protection laws.

What the record companies are doing is one application of imperceptible and robust watermarks, which are hidden to the user and are not eliminated if the content is tampered with, such as being compressed or reformatted in the case of a song, video or photograph. Such watermarks are difficult, though not impossible to remove, and the Wavila researchers wanted to gain a better understanding of how someone would go about trying to crack the watermarking algorithms.

'We organised competitions in which we invited researchers from around the world to try to remove watermarks from pictures without damaging the images,' explains Christian Kraetzer, the assistant coordinator of the Wavila virtual lab at Magdeburg University in Germany. 'The competitions were not intended to prove how well a specific watermarking technique performs. Instead, they gave us a better understanding of the impact of disparate attacks, some of them unknown before the contest.'



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Combined with the Wavila team's theoretical breakthroughs in the watermarking domain, such information will all but certainly prove invaluable to researchers looking to develop new ways to protect digital content. 'As with cryptography in general, you create an algorithm, have others test it, and when it gets cracked you improve it or start fresh,' Kraetzer says.

Perceptual hashing, an offshoot of the digital watermarking field, was another potential DRM application studied by the Wavila researchers. Also known as digital fingerprinting, perceptual hashing uses software to identify, extract and compress characteristic components of a video, song or picture to create a unique and easily identifiable fingerprint. Not only does that allow digital content to be compared and verified relatively quickly and easily, but it creates new methods for searching digital content.

'By using a snippet of a video with a perceptual hash you could search a database to retrieve the full movie,' Kraetzer notes. 'By broadening the search parameters it could also be used to find similar videos.'

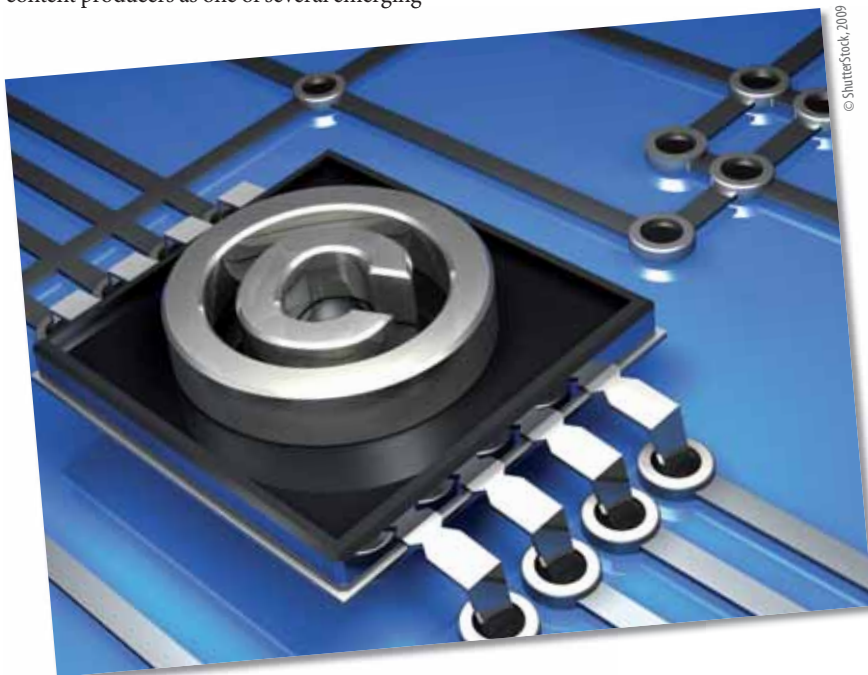
Preneel suggests that movie producers and record companies could use it to find copyrighted content on the web. They could, for example, use digital fingerprinting to identify snippets of videos on video sharing websites, such as YouTube, or to find copyrighted songs that have been used to compile so-called mash-up music tracks.

With companies dedicating increasing amounts of time and money to fighting digital piracy, technologies, such as digital watermarking and perceptual hashing, will all but certainly find their way into new commercial applications over the coming years. However, because of the fear among companies that disclosing applications publicly makes them easier to crack, it will be hard to know where and how they are being used.

'Watermarking today is where cryptography was in the 1960s and 1970s, there is still a lot of secrecy. And in some ways it is facing an even more complex challenge,' Preneel notes.

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## Opening the door to Europe's archives

*Historical archives can be difficult to search, especially when relevant documents are held by institutions in different countries. An EU-funded project has shown how a single online portal with a simple graphical interface can speed cross-border searches.*

Most people have used a library but very few will have visited historical archives. Unlike libraries, archives are primarily concerned with conserving records rather than being accessible to visitors. Even with online search facilities, locating archival material is an art best left to specialist researchers who know their way around.

'Archival structures are complex,' says Fredrik Palm of Umeå University, assistant coordinator of the QVIZ project co-funded by the EU. 'Archivists have a duty to maintain the provenance of their records — this is the most important thing they do. And if you keep that structure it doesn't make it easy to find the right information.'

In Europe, researchers have the added headache of dealing with dozens of national archives, not to speak of thousands of private collections all over the continent. And shifting borders over the centuries make it even harder to track down all records about a person or event.

QVIZ was launched in 2006 to find ways to make Europe's digital archives more accessible. Collaborators in five countries have created an online portal that makes it easier than ever to find documents quickly and accurately.

The QVIZ portal brings two main innovations to the task of searching archives. First, it uses a graphical interface with a map and a timeline to let users home in on the place and time they are interested in.

Archives are normally filed under the name of the institution that assembled the records, such as a local authority, church or tax office, each associated with a geographical area. Within the collections,

records are usually organised by place and date.

'So we use space and time as common entry points to a lot of different resources,' Palm explains. 'Archivists traditionally ask about "where" and "when," so these two entry points help to limit the search dramatically.'

The prototype portal allows users to search more than 75 000 archival files containing 16–18 million digital images in the national archives of Estonia and Sweden. Although the two archives are quite separate, and use different indexing systems, QVIZ can search both simultaneously and return a single set of results.

The key to locating the correct records is a complex ontology that describes how the hierarchy of administrative units has changed over time. It is based on an ontology devised for the United Kingdom by the University of Portsmouth and used in their extensive *Vision of Britain* website. Although focused on Sweden and Estonia, QVIZ has extended the ontology to include 71 000 units covering the whole of Europe.

Estonia was ruled by Sweden from 1561 to 1721 and the overlapping archives are a test of how well QVIZ can cope with changing borders. Because the ontology does not rely on precise geographical coordinates it can even cope with older administrative units whose boundaries may be poorly known.

Many archives use online finding aids to help locate resources but they all require knowledge of the host language. QVIZ allows researchers to find what they need without being able to read either Swedish or Estonian.

A second innovative feature of QVIZ is the use of social bookmarks to allow users to create a trail that others can follow. 'We want to involve the user communities so they can share knowledge and add information to the archival description,' Palm says.

Visitors can tag information that is of particular interest in much the same way as users of sites, such as Delicious or other social networking software, so helping other people to find the same material.

Palm stresses that the information to support social bookmarking is held within the QVIZ platform itself and not in the archival source material. 'We will never change the original records, this is on top of everything and outside the archival system.'

The QVIZ project, which was supported by the Sixth Framework Programme (FP6), came to an end in April 2008. The platform is a working prototype but it is not hard to see how the principles could be extended to include archives from many other countries. The long-term dream is a single portal that will allow users to search all the archives in Europe, but that is still many years away.

One step in that direction is another EU-funded project, Europeana, which is launching a portal to provide access to 2 million items selected from museums, libraries, archives and audiovisual collections across Europe. The know-how from QVIZ will feed into it.

'I think they will be inspired by what we have done and we are willing to help them get it right,' says Palm. 'Mixing libraries, archives and museums together is always a challenge.'

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90195>



## Optimisation of industrial value chains

*Software tools are widely used for the design of value-adding chains according to the strategic and tactical objectives of a company. Within the Ametist project significant steps have been made towards identifying the solution which actually optimises the operations involved and decreases costs.*

Problems occur in the many and varied industrial domains. The Ametist project sought to contribute to solutions by providing mathematical tools for the detection of errors. Moreover, the foundation for a unifying framework for modelling and manipulating time-dependent systems was laid.

In particular, the scientists sought to translate state-of-the-art research into sophis-

ticated automatic tools that would allow real-time scheduling of production lines in factories. Project partner Axxom Software AG provided a value chain optimisation problem which represented typical resource allocation and scheduling tasks as they occur in lacquer producing industries.

Each component of a pipeless batch plant serving as benchmark was modelled as a system with well-defined dynamics. All that could take place during batch processing was expressed in terms of behaviours; these were generated by the dynamical systems and constituted the semantics of the problem. The scheduling problem comprised operational costs per amount of



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## Better scheduling of real-time systems

*Research within the Ametist project was inspired by problems encountered in other disciplines, and the applicability of the tools developed for testing computer systems were validated by tackling these problems.*

Computer systems penetrate all aspects of everyday life; sometimes in easily recognisable forms such as PCs, but also hidden in mobile phones, cars and even washing machines. On the other hand, the development of the associated software is hindered by the limited scientific insight into security and reliability as well as efficiency problems and their solutions.

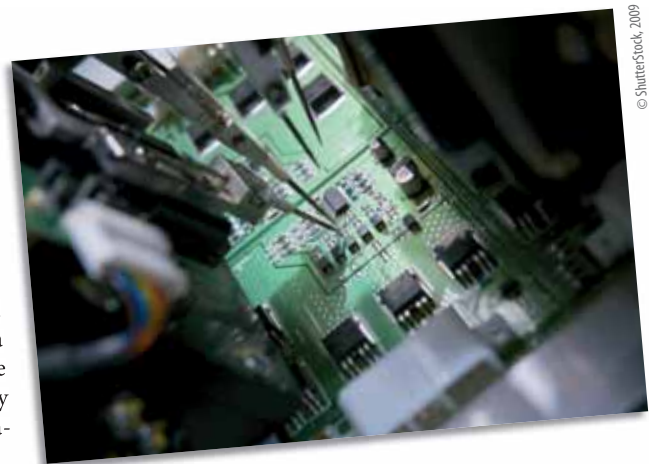
Researchers within the framework of the Ametist project worked on developing a sound and well-understood theoretical basis to the methods underlying software development. More specifically, substantial progress was made in developing mathematical models of complex, distributed real-time systems that could be used to validate their correct functioning.

Project partners at Aalborg Universitet in Denmark sought to establish timed automata as a unifying model for a large class of systems where timing information plays a crucial role. With the term 'timed automata' they defined the more essential mathemati-

cal model of a dynamical system equipped with a clock that measures time.

Timed automata were used in the same sense that differential equations underlie a large number of physics and traditional engineering problems. However, the basic timed automata formalism was extended to allow the continuous consumption of resources, such as energy, to be modelled and analysed.

In this way, different feasible schedules could be distinguished according to their consumption of resources, with obvious preference for the optimal schedule with the minimal resource requirements. The algorithms developed for priced timed automata have already been made available in the recently released real-time verification tool *Uppaal cora*.



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product, as well as costs for the delayed finishing of jobs and storage expenses for early completion of an operation sequence.

Optimisation-based methods were applied for the verification of the system structure, which was modified to achieve correct and optimal behaviours. Valuable experience gained with the Axxom case study showed that the application of model checking techniques for scheduling is promising.

Researchers at Dortmund University did not only provide extensions of the basic models. Their modelling efforts provided fundamental knowledge on how to address a great diversity of phenomena with the use of the so-called timed automata family of models.

Timed automata were not found to be a push-bottom technology to be applied without modelling and solution strategies specifically developed for the case under study. The generation of libraries for typical configurations appeared, however, as a path towards more widespread and easier application for non-specialist users.

Funded under the FP5 programme IST  
(User-friendly information society).

Collaboration sought: information exchange/training.

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With the help of this technology, dedicated to analysing and automatically debugging complex reactive systems, several challenging industrial problems were tackled. These include scheduling lacquer production and a car periphery supervision system, as well as the implementation of a bi-phase mark protocol.

Funded under the FP5 programme IST  
(User-friendly information society).

Collaboration sought: further research or development support; information exchange/training.

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## Online tools help students search for meaning

*With universities storing ever more teaching resources online, how do students and tutors find what they need? European researchers have devised novel ways to classify and locate teaching materials — and in eight different languages.*

University students no longer learn from lectures and books alone. Thanks to the internet, they now have access to a huge range of supporting material, such as lecture notes, assignments, articles, and so on. To organise this material effectively, most universities have invested in a 'Learning management system' (LMS) to archive and present documents online in a systematic way.

But as the volume of material grows, both students and tutors have the problem of locating the information they need. 'In general it can be hard to find what you are looking for,' says Dr Paola Monachesi of the Institute of Linguistics at Utrecht University. 'The normal way to search the LMS is by a full text search. That's what you do in Google, you just type a word and get a list of results.'

Unfortunately, such searches ignore the relevance and suitability of the learning objects they identify. An EU-funded project called 'Language technology for eLearning' (LT4eL), involving universities in 10 European countries, has devised new ways to search by meaning rather than by text.

One approach is to search by metadata — keywords and other labels that tell a potential user much more about a document — but metadata has to be entered manually by the author and the task is often neglected. 'We thought, can we develop a system where keywords are assigned automatically or semi-automatically?' says Dr Monachesi, who coordinates LT4eL.

The project has created a keyword extractor that analyses each document in the LMS archive and proposes a list of keywords that the author can accept, reject or modify. The prototype focuses on material in computer science and e-learning and has been designed to work with documents in

Bulgarian, Czech, German, English, Dutch, Polish, Portuguese and Romanian.

Trials show that it works faster and more consistently than manual annotation. A related tool even extracts definitions from the material to build a glossary of key terms.

Although online dictionaries are already available, they do have some shortcomings. 'Very often the words are ambiguous so you don't really know the proper definition in the context of your learning object,' Monachesi explains. "'Key", for example, might mean the key of a keyboard or a key to open a door.' The LT4eL tool ensures that the offered definitions make sense in the context of the course material.

A second, potentially very powerful approach, allows users to search for information by concept. The semantic search tool organises keywords and definitions in a hierarchy according to their meaning — an ontology — revealing the relationship between them. For example, a student searching for information about HTML, the language used to mark-up web pages, would also be pointed to material about XML, as both are used for similar purposes.

But the real richness of the LT4eL system is that the resources can be cross-referenced between several different languages. 'Since we classify documents through topics we can also search in different languages at the same time,' Monachesi points out. 'I had Polish students who could speak English, the course was in English, but they preferred to read documents in Polish. With such a system, I could search in English or Dutch but get Polish documents. So my students could get material in their own language even though I don't know Polish.'

The system has obvious benefits for students on exchange programmes and those studying a field where much of the material is not available in their native tongue. Because of the choice of languages, the project should help develop ties between ICT research communities in the new EU Member States and the rest of the EU.



Although the project has been designed with higher education in mind, the tools have been tested with schools in Romania and should also be useful for industrial training. LT4eL was supported by FP6, and the Seventh Framework Programme (FP7) is funding its successor, 'Language technology for lifelong learning' (LTfLL) which will be further developing the semantic search.

'We see a lot of potential in the semantic search but we noticed that students don't use it in the way they could,' says Monachesi. 'I think this is because it's new and different from what they are used to on Google, for example.'

So, among other things, the new project will look at the tagging system popular on social networking websites like Flickr and YouTube to see if it could be adapted to make the semantic search more user-friendly.

'Maybe we can find a semantic representation more lightweight than our very structured ontology that may be difficult for people to understand.'

For the purpose of the project the LT4eL tools have been integrated into the ILIAS learning management system but Monachesi stresses that the tools are open source and are freely available from the project website and SourceForge. 'This gives the widest possible distribution and dissemination — anybody could use them — but the licence would also allow for commercialisation.'

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<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90187>

## Reader for electronic identification of livestock

*A hand-held device was developed to carry out the electronic identification of livestock by reading transponders contained within the animals.*

Past food scares have made the traceability of meat an important issue for consumers. The 'EID + DNA tracing' project has developed a system based on electronic identification (EID) by radiofrequency (RF) in livestock.



Researchers used 32 mm HDX glass encapsulated transponders, which were placed in a large pill-like bolus for cattle, sheep and goats. For pigs the transponders were injected into the body cavity. This arrange-

ment enabled the safe tracing of animals and meat to be carried out. The project has increased the level of knowledge regarding EID in livestock. It has provided a real-time tagging and tracing methodology, which could be used on farms up until the animals are slaughtered.

Researchers developed and tested a new hand-held transponder reader, also known as a transceiver. The

battery-powered device is capable of reading the transponders, which comply with international standards and store the information for administrative use on farms. The reader possesses an inbuilt antenna but could also be connected to a conventional stick antenna; it uses wireless communication by RF to interface with computers. This enabled the configuration, downloading and loading of information on the reader at a distance of up to 30 m.

The hand-held reader is both waterproof and shockproof and uses a 13.2 V and 650 mA power supply and it also contains a replaceable data memory of up to 32 MB. The user interface comprises a 49-key keyboard plus a 128 x 64 pixels transreflective LCD, meaning it transmits and reflects light. In portable electronic devices the transreflective display is able to save battery charge, since in bright environments no backlighting is required. The device can read 134.2 kHz ISO transponders from a distance of 38 cm. The reader is designed to work in temperatures between -10 to +55 °C.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

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## Aquaculture cryopreservation video guide

*A DVD which outlines the cryopreservation method by presenting it in a step-by-step guide has been put together as part of the FreezeBass research initiative. It can be used as a research tool by students or as part of a training course by companies.*

As part of a collaborative effort, a DVD which presents an explanation of the cryopreservation process and its realisation in aquaculture was made. Images and text were collected from the French Research Institute for Exploitation of the Sea (Ifremer) and edited into a 10 minute, comprehensive step-by-step guide. It is available to companies or researchers who need to use the cryopreservation method in their work. It can also be utilised for training purposes, be it for staff training, or to teach university students about the methods and tools needed in this process.

This initiative evolved out of the EU-funded FreezeBass project. Its aim was to support mariculture industries around the Mediterranean basin by breeding genetically improved strains of marine fish in order to ensure that this industry remains competitive. This is of particular significance as marine culture industries are beginning to transform into commodity-style agribusinesses. Cryopreservation methods were used

in the project to set up a bank of sperm for the seabass, *Dicentrarchus labrax*. Selection programs for this process were set up in France, Greece, Israel, Italy and Spain.

Cryopreservation methods in aquaculture are supported by the project members as they represent a step towards achieving sustainable fisheries and allow for an increase in the genetic variability of farmed populations by an adequate mixing of genes. The method also allows for the possibility of long-term protection of genetic progress with the possible saving of the last male generation used in a breed-



ing program. Sperm from specific males can also be selected more easily for progeny production.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: joint venture agreement; licence agreement; marketing agreement; manufacturing agreement; financial support; information exchange/training; venture capital/spin-off funding; private-public partnership; available for consultancy.

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**See also page 15 (Egg envelope proteins provide a key to cryopreservation)**

## Semantic desktop paves the way for the semantic web

*European researchers have developed innovative software to make finding information on your computer and sharing it with others considerably easier. In the process, they may have solved the chicken and egg problem that has held back development of the semantic web.*

Annotating information with semantic data so that its meaning is understood by machines as well as humans has been heralded as the next evolution of the internet — giving more meaningful structure to the jumbled and disjointed results of web searches. However, the vision of the semantic web has largely failed to materialise because there is little incentive to create semantic content when there are few services that use it. And there are few services that use it because there is so little semantic content.

Rather than getting stuck in this vicious circle, the researchers behind the Nepomuk project sought to bring semantic information closer to the user, focusing not on how it could be used on the web but on how it can help people find and structure information on their personal computers and share it with others in a network. The result is what the Nepomuk team calls a social semantic desktop and it could be the key stepping stone to realising the vision of the semantic web.

'In making data and connections between data easy to find and identify, the semantic desktop gives people a very personal motivation to start annotating their information. The next logical step is for that information to be shared, and you therefore have a starting point for the semantic web,' explains Ansgar Bernardi, the coordinator of the EU-funded Nepomuk project.

Nepomuk's desktop solution offers plenty of incentives for people to get to grips with semantic information. By giving meaning to documents, contact details, pictures, videos and all manner of other data stored on a user's computer, regardless of file format, application or language, the semantic desktop makes it easier and faster to retrieve information and to identify connections between different information items.

'For example, I was taking notes at a summer school we recently held in Malta and I was writing the information into a wiki application on my computer. With Nepomuk installed, each time I mentioned a speaker's name I was given the opportunity to link to contact details and other data about that person I already had stored on the computer,' Bernardi, a researcher at the German Research Centre for Artificial Intelligence (DFKI), explains.

The need to identify connections between a person and information, and between different people was one of the key inspirations of the project. 'The idea of building a semantic desktop arose from the fact that one of our colleagues could not keep track of the girlfriends of his friends because they kept changing,' Bernardi says. 'Social networking sites such as Facebook only go half-way towards solving the problem because they do not provide an actual assessment of relations between people based on all the information available to you and your interpretation of it... Much of that information is hidden on your computer in files, emails, contact books, pictures, in the names and structures of your folders. Nepomuk provides a more efficient way of managing that information.'

When information is added, the Nepomuk software, which consists of independent applications and plug-ins for third-party programs, prompts users to annotate it so that it can be correctly situated in what Bernardi describes as their personal information view of the world.

What's more, when the Nepomuk software is installed it crawls the user's computer in search of information and then begins to establish connections between different information items.

Users can decide what information to share with others by setting access permissions for individual information elements. Using a peer-to-peer architecture or a direct connection, the Nepomuk software then establishes semantic connections between data stored on different users' computers, creating a semantic network that is only one step away from the vision of the semantic web.

The benefits of the technology are being highlighted in four case studies. At the Institut Pasteur in Paris, the software is being used to create an electronic lab book to help researchers document experiments in the bio-science laboratory and link references to the original sources.

At software developer SAP, it is being used as a task-management solution, allowing developers to collectively organise their time.

At TMI group, it is being used to network the organisation's consultancies in different European countries, helping one consultant use the experiences of others to provide solutions for clients.

And at Mandriva, a project partner and distributor of the Linux open source operating system, the software is being used to power its knowledge base.

The Nepomuk project, which ended in December 2008, has already elicited widespread interest from the open source development community. New applications and software plug-ins are being worked on by developers outside of the project consortium. These allow Nepomuk to function with third-party programs, such as the Firefox open source web browser and email readers, such as Thunderbird and Microsoft Outlook.

Nepomuk's semantic annotating and tagging system has been incorporated into the K Desktop Environment 4 (KDE) that is distributed with some versions of Linux, while a pure Java implementation, based on the Eclipse platform, is also published by the consortium.

One spin-off company from coordinating partner DFKI is in the process of being established, and Bernardi says others may follow.

In the meantime, the consortium plans to establish the Open Semantic Collaboration Architecture Foundation to support the Nepomuk results after the project ends. They are actively seeking industrial and academic partners to help in that goal, offering them, in exchange, the chance to participate in what could be the key software breakthrough that turns the semantic web from a vision into reality.

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<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90221>



## Economic concepts of resource allocation in web services

*Considerable efforts have been devoted in the past to developing software applications which allow users to obtain web services on demand. These applications form large-scale application-layer networks that gradually evolve towards global self-organisation.*

Application-layer networks are software architectures that coordinate the provision of services requiring increased computational resources by connecting large numbers of individual computers. For example, the grid and peer-to-peer computing take advantage of such architectures for processing and storing the ever-growing sets of observed and simulated data from today's physics experiments.

To keep these complex networks operational, a new resource-allocation and service-control mechanism was introduced within the Catnets project. Moreover, this decentralised coordination mechanism, based on the economic paradigm of Catalaxy, was evaluated against a baseline control mechanism where decisions were taken by a single resource and service provider.

The catalactic coordination mechanism characteristic is that multiple self-interested

software agents would buy and sell network services to and from each other by weighing and choosing preferred alternatives. By means of computer simulation experiments, project partners at the University of Bayreuth in Germany achieved proof that it is able to successfully provide timely service to clients.

The primary aim of these experiments was, however, to compare the obtained results with those of a centrally-coordinated system. Real-world application networks with different densities of service and resource providers were, for this purpose, simulated in a high- and low-dynamics environment. High dynamics were attributed to networks where resources would be made available and consumed with high frequency. Peer-to-peer networks could be described as networks with high node density, as well as high dynamics.

## A free market for grid services

*What made economics so attractive for the Catnets project partners was their quest for an efficient approach to the allocation of computational resources, provided by suppliers and in demand by customers.*

As the number of digital devices connected to the internet has exceeded the 1 billion milestone, computer scientists are working on merging stand-alone grids and data centres, but also servers and PCs. To allow for the fair sharing of available computational resources and subsequently the efficient distributed processing of petabytes of data, a new decentralised coordination mechanism was proposed.

Most of the existing mechanisms relied on the existence of a centralised resource broker that coordinated access to computational resources, and was implemented over the grid middleware. Within the Catnets project an alternative mechanism, inspired by the catalactic free-market paradigm proposed by von Hayek in the 1930s, was explored.

The catalactic free-market mechanism applied to application layer networks (ALNs) is based on the constant exchange of information between trading agents that operate on behalf of service providers and users. The development of self-organising agents would ultimately lead to networks that behave in a peer-to-peer (P2P) fashion. This mechanism was considered to be particularly suited to open computing sys-



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An application-layer network implementing catalactic coordination was observed to achieve higher rates of demands, for which the network provided a service. But this result was gained at the expense of higher communication cost and inferior response times. Contradicting results led Catnets project partners to further explore not only artefacts, but also limitations of the simulation software.

Funded under the FP5 programme IST  
(User-friendly information society).

Collaboration sought: further research or development support;  
information exchange/training.

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tems, where detailed information on trading agents may not be provided.

Query and data mining services could be for example traded on the service market. Purchasers could procure supplies for a construction project by using the 'Collaborative virtual teams' (Covite) application. Primarily intended for the construction industry, it was extended by project partners at the University of Cardiff to the search through distributed product catalogues.

Grid computing may also find particular use in mapping low-level data, which are usually too voluminous to analyse, into more compact or abstract forms during the data mining process. At the core of the process lies the application of dedicated methods for pattern discovery and extraction. During the course of the Catnets project, services that implement the different phases of the discovery workflow were successfully combined.

The experience gained from these prototype applications will be used to identify how other industrial applications could benefit from the catalactic free-market mechanism.

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Collaboration sought: further research or development  
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## Virtual desktop for mobile parliamentarians

*Members of parliament (MPs) and other citizen representatives now have a new tool at their fingertips to help them keep on top of their work while on the move — a virtual desktop providing an integrated approach to remote committee management.*

One of the major challenges for our elected representatives is to stay on top of the increasing amounts of information they are required to process and, at the same time, maintain contact with the people who elected them.

MPs are very often on the move — participating in official functions, meetings and debates, and having to travel between parliaments and their constituencies. At the same time, they are required to keep abreast of issues being debated and to contribute positively to these debates. New information and communication tools, managed effectively, could make a significant contribution to facilitating their task.

A European consortium, including five elected assemblies, has developed and carried out initial testing of a virtual desktop which integrates state-of-the-art information management, mobile technologies and security systems to provide personalised, remote access to information databases, and facilitate information sharing and collaborative working.

The EU-funded eRepresentative project focused on developing a tool to facilitate committee work, a central feature of most elected assemblies. Representatives from three national parliaments (Lithuania, Hungary, Netherlands), one regional parliament (Catalonia) and a local county council (Westmeath, Ireland), tested the platform over a period of three to four months.

'Elected officials are required to deal with increasing amounts of information, often having to work on multiple issues at the same time and to work on those subjects in collaboration with their colleagues through committees,' says project representative, Evika Karamagioli.

'eRepresentative provides a very user-friendly application to help MPs carry out this work remotely and it can be easily incorporated into the work of elected assemblies as is,' she adds.

The core user requirements established included: improved access to background documents; regular updates on the progress of an issue; facilitation of online collaboration; the sharing of documents and views; and even remote participation in decision-making.

Over 70 % of representatives involved in the project confirmed that eRepresentative was easy to use, allowed trouble-free retrieval and sharing of documents and that the secure discussion space helped them feel better prepared for committee meetings.

'Discussions are currently underway with several of the participating partners, as well as other elected assemblies, with a view to formally introducing the application at institutional level in the near future,' confirms Karamagioli.



The project also welcomes contacts from any other elected assemblies interested in implementing this tool, particularly given that a longer-term objective of the project partners is to ensure interoperability of parliaments across Europe.

eRepresentative addresses the need for secure communication between elected representatives, but the principles of the tool can also be applied more generally to improve communication with citizens themselves, and to provide them with a means of contributing to debates.

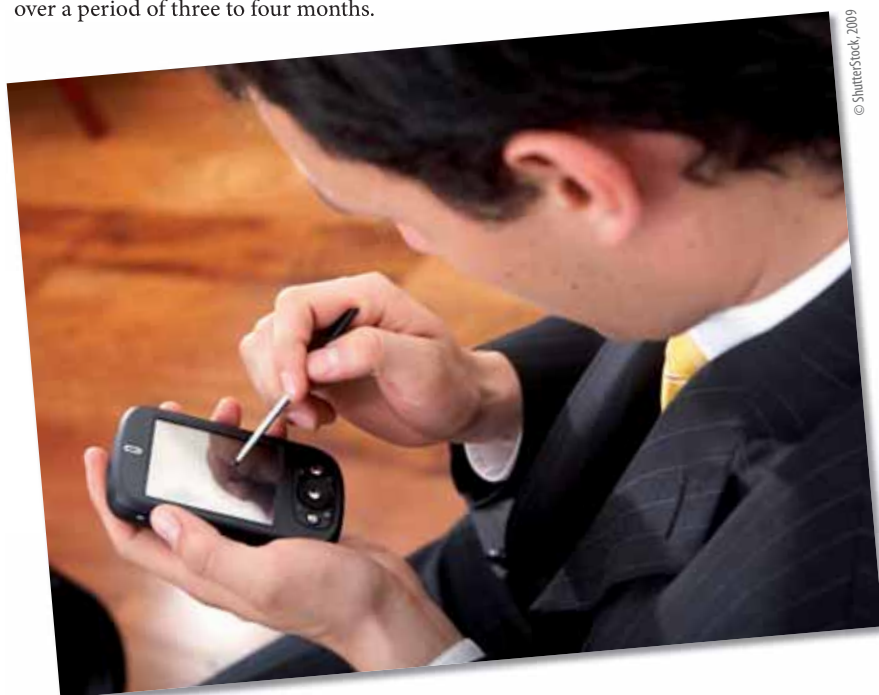
Generally speaking, studies have revealed a rather patchy uptake of ICT within elected assemblies so far, with initiatives in this direction being taken on an individual rather than an organisational level. Some have even suggested that this could lead to a marginalisation of the role of the elected representative in governance as they get left behind in the networked society.

By closely involving end-users in both the establishment of user requirements and the evaluation of the application itself, the eRepresentative project provides a promising example of a tool that could facilitate the adoption of effective ICT solutions on an organisational rather than an individual basis.

Information from eRepresentative is now being taken to the next level in the Demos@Work project, which involves many of the same partners. This project involves both MPs and citizens, however it focuses specifically on the issue of public health and smoking.

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<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90156>



## Computing in a molecule

*Over the last 60 years, ever-smaller generations of transistors have driven exponential growth in computing power. Could molecules, each turned into minuscule computer components, trigger even greater growth in computing over the next 60?*

Atomic-scale computing, in which computer processes are carried out in a single molecule or using a surface atomic-scale circuit, holds vast promise for the microelectronics industry. It allows computers to continue to increase in processing power through the development of components in the nano- and pico scale. In theory, atomic-scale computing could put computers more powerful than today's supercomputers in everyone's pocket.

'Atomic-scale computing researchers today are in much the same position as transistor inventors were before 1947. No one knows where this will lead,' says Christian Joachim of the French National Scientific Research Centre's (CNRS) Centre for Material Elaboration and Structural Studies (CEMES) in Toulouse, France.

Joachim, the head of the CEMES Nanoscience and Picotechnology Group (GNS), is currently coordinating a team of researchers from 15 academic and industrial research institutes in Europe whose groundbreaking work on developing a molecular replacement for transistors has brought the vision of atomic-scale computing a step closer to reality. Their efforts, a continuation of work that began in the 1990s, are today being funded by the EU in the Pico-inside project.

In a conventional microprocessor — the engine of a modern computer — transistors are the essential building blocks of digital

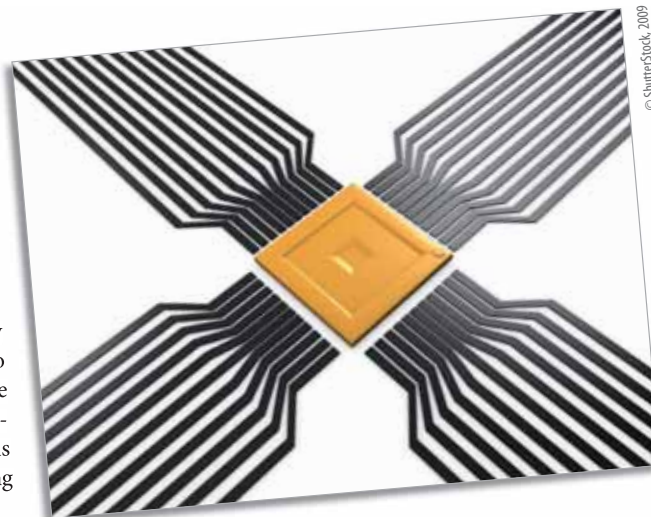
circuits, creating logic gates that process true or false signals. A few transistors are needed to create a single logic gate and modern microprocessors contain billions of them, each measuring around 100 nm.

Transistors have continued to shrink in size since Intel co-founder Gordon E. Moore famously predicted in 1965 that the number that can be placed on a processor would double roughly every two years. But there will inevitably come a time when the laws of quantum physics prevent any further shrinkage using conventional methods. That is where atomic-scale computing comes into play with a fundamentally different approach to the problem.

'Nanotechnology is about taking something and shrinking it to its smallest possible scale. It's a top-down approach,' Joachim says. He and the Pico-inside team are turning that upside down, starting from the atom, the molecule, and exploring if such a tiny bit of matter can be a logic gate, memory source, or more. 'It is a bottom-up or, as we call it, "bottom-bottom" approach because we do not want to reach the material scale,' he explains.

Joachim's team has focused on taking one individual molecule and building up computer components, with the ultimate goal of hosting a logic gate in a single molecule. 'The question we have asked ourselves is how many atoms does it take to build a computer?,' Joachim says. 'That is something we cannot answer at present, but we are getting a better idea about it.'

The team has managed to design a simple logic gate with 30 atoms that perform the same task as 14 transistors, while also exploring the architecture, technology



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and chemistry needed to achieve computing inside a single molecule and to interconnect molecules.

They are focusing on two architectures: one that mimics the classical design of a logic gate but in atomic form, including nodes, loops, meshes etc., and another, more complex, process that relies on changes to the molecule's conformation to carry out the logic gate inputs and quantum mechanics to perform the computation.

The logic gates are interconnected using scanning-tunnelling microscopes and atomic-force microscopes — devices that can measure and move individual atoms with resolutions down to 1/100 of a nanometre (that is 1/100 000 000 of a millimetre!). As a side project, partly for fun but partly to stimulate new lines of research, Joachim and his team have used the technique to build tiny nano-machines, such as wheels, gears, motors and nano-vehicles each consisting of a single molecule.

'Put logic gates on it and it could decide where to go,' Joachim notes, pointing to what would be one of the world's first implementations of atomic-scale robotics.

The importance of the Pico-inside team's work has been widely recognised in the scientific community, though Joachim cautions that it is still very much fundamental research. It will be some time before commercial applications emerge from it. However, emerge they all but certainly will.

'Microelectronics needs us if logic gates — and as a consequence microprocessors — are to continue to get smaller,' Joachim says. The Pico-inside researchers are currently drafting a roadmap to ensure computing power continues to increase in the future.

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<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90295>



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## Testing chambers for wiring standards

*Safety in the home, the office, warehouses — in fact in any building in which there is electric cable and power appliances is a very serious concern. Hundreds of instances exist in which fires have been attributed to old or poor wiring in buildings.*

Funded by the EU, the LVD project sought to support measurement and testing of laboratories in which cabling can be tested to the required standards established by the EU. These regulations require that cables be tested to withstand conditions of humidity of 91 to 95 %. Moisture resistance is of particular concern because cables are often wired in places where moisture can accumulate.

These test chambers are especially important for newly associated states (NAS) who are required to meet and implement

European standards on the Low-voltage Directive. A drawback associated with these chambers is that by using different salts such as sodium sulphate ( $\text{Na}_2\text{SO}_4$ ), and potassium nitrate ( $\text{KNO}_3$ ) attaining suitable testing conditions in the chamber is practically impossible. Furthermore, as the older climate chambers (especially those with psychrometric regulation) cannot easily test humidity to the required standards, a reliable means of assessment of chambers was seen as a necessary tool.



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Since evaluation standards on such chambers did not exist, developing a suitable testing procedure, taking into account metrological factors as well, was required. On this basis, the project was able to establish a chamber evaluation standard. The developed evaluation system is portable, suitable for both on-site and laboratory use. Moreover, both thermocouples and platinum resistance thermometers can be used. The system can also be used to determine the thermal signatures, gradients' fluctuations in laboratories or larger places such as homes, warehouses and even cold storage.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4609

**See also page 22 (Proper enforcement of the Low-voltage Directive)**

## Innovative sensor solutions

*Synthetic nanostructured materials that respond in the presence of highly reactive as well as less reactive saturated hydrocarbons were integrated into miniaturised optoelectronic sensors. By exploiting a Mach-Zehnder interferometer configuration, this new class of nanophotonic sensors possesses high sensitivity and reliability at low cost.*

Sensors play a fundamental role in a variety of applications and in particular in industrial environments. Among the various types of sensors, gas sensors based on optical detection have attracted considerable attention due to the possibility they offer to measure chemical agents at extremely low concentrations. More specifically, precise measurement of the gas concentration can be based on detecting changes in the refractive index of nanostructured and nanocomposite materials.

Various basic materials have been extensively tested and studied as sensing media for this purpose. These included zinc oxide ( $\text{ZnO}$ ), tin dioxide ( $\text{SnO}_2$ ) and even polyethylene oxides which react in the presence of reducing gas agents such as nitrogen oxides ( $\text{NO}_x$ ), sulphur oxides ( $\text{SO}_x$ ) and other pollutants. The Nanophos project partners at the University of Southampton

worked on the integration of thin films of nanostructured and nanocomposite materials into miniaturised optical sensor devices.

They aimed to draw an alternative route to new advanced standards for gas detection and analysis. A class of new instruments based on the same principles as Mach-Zehnder interferometers was introduced to provide for well-defined and repeatable performance and specifications. Soda lime glass chips were used as a substrate, on which waveguide optical components were integrated by means of an ion exchange process. Alternatively, direct laser writing was used to pattern hybrid organic-inorganic optoelectronic elements on a chip.

These research efforts have yielded the prospect of annihilating technological constraints in the development of gas sensors

that can consistently cover long-standing industrial needs. By taking a step beyond the established gas sensor concepts, integrated optical sensors with advanced sensitivity and stability were fabricated that could be used under unusual and extreme conditions.

Funded under the FP5 programme IST (User-friendly information society).

Collaboration sought: further research or development support.

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## Novel photocatalytic coating technologies

*Researchers have developed a set of protocols for assessing the photocatalytic activity of materials that are semiconductor-based and a range of intelligent inks for photocatalytic detection.*

Semiconductor photocatalytic (SCP) films have paved the way for new green technologies. Applications include self-cleaning windows, photovoltaics, sterile surfaces, air purification and the elimination of organic contaminants. Such innovations result in a higher quality of life and improved health and safety for European citizens.

A decrease in the need for cleaning chemicals, reduced emissions and reduced energy use all have a beneficial impact on the environment. Although SCP materials and processes represent a major new technology, wider application has been hampered by the absence of suitable materials and coating technologies.

The Photocoat project has developed innovative large-volume coating technologies

with enormous potential. Researchers produced a set of protocols for assessing the photocatalytic activity of largely titania-based SCP materials in the form of clear and opaque films and powders. Existing ink technologies were used to create inks suitable for detecting the activities of photocatalytic materials.

The standard photocatalyst assessment methods developed and the range of intelligent inks produced have been invaluable to manufacturers, customers and legislators. The Photocoat research team also developed a new measurement system for studying transparent and opaque photocatalytic materials.



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Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support; licence agreement; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4689

## Control of noise at press machines

*Quietness has become a critical product attribute in punching and die stamping equipment, and manufacturers that cannot measure up will have a hard time competing in the international market. The Noiseless project partners achieved the reduction of noise emissions with sound-damping add-ons and structural modifications when problems cropped up during prototype testing.*

Press machines are inherently noisy, and several of them are often used at the same time, all contributing to a cumulative noise exposure for operators and nearby workers. Many press users have taken all the reasonably practicable measures to reduce noise at source and still rely heavily on the use of hearing protection. The sound emitted due to the machine's increased operational speed together with the reduced weight of

its mobile elements has to be decreased through constructive changes in the manufacturing process.

The difficulty in identifying the correct solution to noise problems demands specialists with a high level of knowledge and expertise. This level of qualification involves the command of specialised simulation and experimentation techniques.



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Particularly important is the knowledge of the damping and absorbing properties of different materials. Recently, knowledge accumulated within the Noiseless project has opened the way to new possibilities through the application of adaptive control techniques.

As Fagor Arrasate, S.Coop., a company

orientated towards the world market, sought to learn how to more efficiently lower noise emissions on its products, they looked for new methods. The strategy was to establish a method that would enable their engineers to predict noise in the early stages of product development, when designs can be more readily optimised.

For this purpose, noise assessments were carried out on an operational press machine that was selected as representative of the advanced equipment Fagor Arrasate is supplying all over the world. These were more than a series of noise measurements because they aimed to relate the noise sources to the machine's internal structure and define specific mobile elements contributing to the noise.

The noise assessments gave clear recommendations on what measures needed to be taken, which included both passive measures as well as active ones. Modifications in the machine carriages' design were finally incorporated in the optimisation strategies. The changes reduced direct airborne noise and provided active reduction of structure-borne noise by damping local resonances with actuators.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4735

## A patent success

*An EU-funded project has created a powerful patent search service for small and medium enterprises (SMEs). It is a major step forward as patents and patent information are extremely valuable.*

We live in a knowledge economy, and patents are the legal tender. They define a company's or individual's stake and they are the mechanism by which ideas can be both exchanged and, at the same time, protected.

But getting patent information can be difficult. There are many databases scattered across Europe and the rest of the world, and the search options are limited: they are either cheap but restricted, or effective but very expensive. You must either go through each source for information, or pay hefty fees to a specialist who does it for you.

That leaves SMEs, the majority of Europe's enterprises, in a bind: either they struggle with the awkward, difficult and time-consuming cheaper search (which ends up costing money in any case because of the time personnel must devote to the work), or they incur serious costs using professionals.

The final option is to ignore patents altogether, but this is a costly option, too. Costly in terms of the lost opportunities, as most SMEs don't even begin to suspect the value of the information discovered through patent searches.

Innovall, an EU-funded project, is keen to see SMEs not miss out on the value of patenting and patent knowledge.

For example, one company that participated in the Innovall project, a tyre manufacturer, sought a solution to a problem

it was having with waste rubber extruded through the mould during the manufacturing process. By using Innovall's search service the tyre company discovered a useful patent in the baking industry of all things. 'It shows how useful and valuable information can be discovered, even if it relates to a completely different industry,' explains Alfredo Silva, coordinator of the Innovall project.

Innovall was set up to explore the best way to make patent search simple. The solution was to create a web portal that essentially acts as the Google for patents. The search engine connects with eight large databases, with hundreds of thousands of patent records.

There are three layers of search that companies can choose from. The most basic level is the function search, which looks for patents in terms of what they do. This may be basic, but it is also very powerful, as the example of the tyre company shows.

Even better, Innovall has used ontologies, which are dictionaries that translate different terms to help define a search. 'For example, you might be looking for a friction device, but the system will also search for words like drag, brake, decelerate and so on,' explains Silva.

That's just the beginning. A company search will look up all the patents registered by one company, a competitor perhaps, and it will list information such as what country, branch or even department submitted the



patent. Finally, Innovall can search by product name, completing the range of services. The results take a bit longer than a standard Google search, but given the nature of the search, this is to be expected.

The 60 organisations — and hundreds of individuals within them — who are currently actively testing the system are very enthusiastic about the results and the information that Innovall retrieves.

These testers will be a key part of the next step. Innovall hopes to convert them to a core group of users of the service when it goes live in earnest. This will boost efforts to commercialise the service, because it must become sustainable if it is going to survive.

Right now, Innovall is considering a variety of business models. One plan is to leave the function service free, and then charge tiered subscriptions for more detailed or specific searches.

For now, the project will continue to perfect the technology until March 2009, when they hope to have their business plans finalised and ready for prime time.

'This is a very important service,' says Silva. 'It fills a glaring gap in current offerings, it empowers SMEs to get to grips with patents, and it offers the potential to boost European competitiveness.'

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<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90368>



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>

### Conference on future technologies

*The 'European future technologies' (FET 09) conference is being organised by the 'Future and emerging technologies' research scheme of the European Commission, the Czech Technical University in Prague and the Academy of Sciences of the Czech Republic. The conference will be held in Prague, Czech Republic, from 21 to 23 April 2009.*

Under the title 'Science beyond fiction', the focus will be on creating new visions and actions for future information and communication technologies (ICTs), based on the scientific opportunities which are available today. The conference will explore new synergies between established disciplines such as computer science, neuroscience, biology, chemistry and economics, and emerging disciplines such as nanoscience and quantum computing. The event will also stimulate new bridges between the exact and social sciences.

FET 09 is the first European forum dedicated to frontier research in future and emerging information technologies and the scientific, societal and policy challenges in this domain. Expected attendees include scientists from around the world, policy-makers and industry representatives.

*For further information on the event, please visit:*  
[http://ec.europa.eu/information\\_society/events/fet/2009/index\\_en.htm](http://ec.europa.eu/information_society/events/fet/2009/index_en.htm)

### Conference on privatisation and public services

*A conference entitled 'Good jobs for good services? The impact of privatisation of public services on employment, productivity and service quality' will be held on 24 April 2009 in Vienna, Austria.*

The one-day conference will take a closer look at the outcomes of liberalisation and privatisation of public services and related processes. There will also be a specific focus on employment, working conditions, productivity, service quality and prices. The conference will examine evidence

and conclusions from further research by European experts on the privatisation of network industries and health services.

Organised in the framework of the EU-funded project 'Privatisation of public services and the impact on quality, employment and productivity' (PIQUE), the PIQUE consortium will also take the opportunity to present the project's main results. Over a three-year period, PIQUE studied the consequences of liberalisation and privatisation in four sectors (electricity, postal services, local public transport and health/hospitals) and six countries (Belgium, Germany, Austria, Poland, Sweden and the United Kingdom).

*For further information, please visit:*  
<http://www.pique.at/conference>

### Conference on planetary defence

*The International Academy of Astronautics (IAA) will hold its first conference on protecting our planet from impacts by asteroids and comets from 27 to 30 April 2009 in Granada, Spain.*

The conference will bring together international experts to discuss:

- detecting and tracking asteroids and comets that might be hazardous to the planet;
- characteristics of these objects;
- deflecting a threatening object should one be detected;
- the nature of impact disasters;
- decision-making in an emergency;
- political, legal and policy issues that must be considered as part of an overall mitigation strategy.

At present, there are over 900 asteroids and comets that are designated potentially hazardous objects (PHOs), objects larger than about 140 m that could eventually threaten Earth.

A particular focus of the conference will be Apophis, a 270 m asteroid discovered in 2004 and which has a current probability of 1 in 45 000 of impacting the Earth in 2036. The conference will also disseminate

a wide range of the latest information related to planetary defence.

*For further information, please visit:*  
<http://www.congrex.nl/09c04>

### Conference on researchers in Europe

*The conference 'Researchers in Europe without barriers' will be held in Prague, Czech Republic, on 28 and 29 April 2009. The event is organised under the auspices of the Czech Ministry of Education, Youth and Sports with the support of the Academy of Sciences of the Czech Republic in the framework of the Czech EU Council Presidency.*

The conference will focus on the research climate and attractiveness of the European research area (ERA). It will try to identify ways to create a better environment for researchers in Europe, foster young talent for research and their engagement in the ERA, and develop research skills and an entrepreneurial mindset among young researchers.

Target participants include: members of the European and international scientific community, research performing organisations, science foundations, representatives of the European Commission and the EU Member States, young researchers and relevant policy-makers.

*For further information, please contact:*  
Jirina Krivkova  
Ministry of Education, Youth and Sports  
of the Czech Republic  
Phone: +420 257 193 545  
Fax: +420 257 193 397

### International conference on vacuum electronics

*The 10th 'International vacuum electronics conference' (IVEC 2009) will be held from 28 to 30 April 2009 in Rome, Italy.*

The event will open with a plenary session covering several topics of broad interest. This will be followed by two and a half days of parallel technical sessions that will include both oral and poster presentations.

Organised by the European Space Agency (ESA), the conference will have a special session dedicated to the technologies and applications of vacuum electronics in space. This session is intended to be

a forum of information and discussion between the various actors in the field (satellite/payload manufacturers and operators, the tube industry, government/institutions, etc.) and to address the main challenges of future space missions.

For further information, please visit:  
<http://www.congrex.nl/09a01>

## ICT brokerage event and information day

*An information and communication technologies (ICT) information day and brokerage event will take place from 29 to 30 April 2009 in Brno, Czech Republic.*

Topics on the agenda include:

- pervasive and trusted network and service infrastructure;
- cognitive systems, interaction and robotics;
- components systems and engineering;
- digital libraries and content;
- towards sustainable and personalised healthcare;
- ICT for mobility, environmental sustainability and energy efficiency.

The event is jointly organised by Masaryk University, Brno University of Technology, the South Moravian Innovation Centre, the Brno Regional Chamber of Commerce, the Transport Research Centre of the Czech Ministry of Transport, FIRST Innovation Park and the Directorate-General for the Information Society and Media of the European Commission. The two-day event will be held under the auspices of the Czech EU Council Presidency.

For further information, please visit:  
<http://www.ict-brokerage.cz/en/>

## Symposium on the prevention of weight (re-)gain

*The EU-funded Diogenes projects will present its key results and insights at an event in Noordwijkerhout, Netherlands, from 4 to 6 May 2009.*

Under the title 'Prevention of weight (re-)gain — diet, genetics, behaviour, screening and novel food ingredients', Diogenes researchers and external experts will discuss the following topics:

- the relative efficacy of different diets in preventing weight gain, regain and co-morbidities;
- genomics-based predictors of weight variation, and biomarkers of nutritional status;

- epidemiological identification of key dietary factors influencing the development of obesity and risk of co-morbidities across Europe;
- a new set of psycho/behavioural tools to identify predictors of weight (re-)gain;
- an obesity risk and behavioural advice screening tool;
- the identification of novel food ingredients systems which induce satiety or satiation while remaining in the preferred sensory range.

The symposium will take place in the framework of the 'European congress on obesity' (ECO 2009).

For further information, please visit:  
<http://www.diogenes-eu.org/ECO2009>

## Conference to connect research

*The European Commission's Directorate-General for Research is organising the conference 'Research Connection 2009 — networking our way to a research future' in Prague, Czech Republic, on 7 and 8 May 2009.*

The budget of the European Commission for research and innovation is increasing every year and the event will give participants to see how they can benefit from it. They will get first-hand information about priorities, objectives and participation rules. In special sessions participants will receive tangible tips. Particular attention will be paid to promising ideas from the new EU Member States.

The event is intended for scientists, entrepreneurs and researchers looking to learn more about successful EU-funded research and funding opportunities and to meet reliable partners for new projects.

A variety of parallel sessions will cover FP7 and its thematic areas. In addition, selected EU-funded projects will be exhibited in order to promote the networking and integration of research activities in Europe.

For further information, please visit:  
<http://ec.europa.eu/research/conferences/2009/rtd-2009>

## International forum on biotechnology

*The '5th International Greek biotechnology forum' (IGBF) will be held on 8 and 9 May 2009 in Athens, Greece.*

The two-day event will present some of the latest research and scientific developments concerning bio-medicine, agrobiotechnology, biofuels, environmental biotechnology and their commercial applications.

The fifth edition of the forum is supported by the European Association for Bio-Industries (EuropaBio), the European Federation of Biotechnology (EFB), the Hellenic Biotech Association, the Greek Pharmaceutical Association, the Athens Chamber of Commerce and Industry, the European Biomass Industry Association (EUBIA) and science and development-related government ministries.

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

## Conference on sustainable development

*The European Commission's Directorate-General for Research is preparing a major conference on 'Sustainable development: a challenge for European research' that will take place from 26 to 28 May 2009, in Brussels, Belgium.*

The conference — organised in cooperation with the Czech EU Council Presidency — will celebrate the multiple ways through which European research contributes to global sustainable development: improved understanding of the environment, technological solutions, changing mindsets and behaviours, bearing in mind that it is also at the roots of unsustainable trends.

The Research DG is seeking to gather scientists, industry, civil society and R & D policy-makers to confront their views and stakes regarding what R & D can and cannot do for sustainability. This will be a key input to further R & D policy-making at EU level.

For further information, please visit:  
[http://ec.europa.eu/research/sd/conference/2009/index\\_en.cfm](http://ec.europa.eu/research/sd/conference/2009/index_en.cfm)

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