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E-mail:  
research-eu-supplements@publications.  
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**Editorial coordination**  
Evi Ford-Alexandraki

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### Keeping focus in times of crisis

*First the financial crisis, then the widespread social unrest, now the H1N1 Influenza A flu crisis — negative global news are currently dominating the airwaves and newspapers. As so often is the case, pessimism keeps outselling optimism. Mankind should look back on its past more frequently to appreciate the enormous progress it has achieved in only a few decades, including in the field of science.*

*Not even a century ago, the infamous 1918 flu pandemic, also called the 'Spanish flu', killed between 50 and 100 million people worldwide in almost 2 years. The current H1N1 virus is not expected to cause anywhere close to this number of casualties, thanks to the widespread availability of antiviral drugs and the introduction of efficient containment measures. All the more reason for the EU to continue its long-standing commitment to supporting research.*

*The lead article of the biology and medicine section describes a strategy developed to provide efficient communication in human biomonitoring. The ESBIO project was especially aimed at improving communication on children-related issues.*

*The energy section begins with an article on the IELAS project which aims to develop a new class of devices for the measurement of electric currents. Researchers working on these new devices discovered that magnetostrictive materials might supply the solution they sought for reducing the size of current measurement transformers.*

*Though an increasing number of Europeans now live in an urban setting, rural regions and their infrastructures should not be left behind, especially as they are attracting more and more tourists. In the Environment section, the Sprite project analysed which measures could be used to develop a more effective and sustainable integrated tourism.*

*The IT and telecommunications section opens up with a contribution on the NEXT project, dedicated to developing a new computer memory and data storage technology. This new generation of devices combines standard microelectronics with effects arising from the interaction between electrons' spin and the magnetic properties of conducting materials.*

*Ever since mankind has started to use metals, corrosion has been a constant and annoying occurrence. Partners in the 'Bilayer molecular coating' project have developed a new type of permanent organic layer for metallic surfaces, which when applied to electrical contacts, promises to minimise degradation due to both friction and corrosion.*

*Finally, the events section wraps up with a selective overview of upcoming event announcements in the field of research.*

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*The editorial team*



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To read up on the project presented in the offer, click on 'view related results' at the end of the text and then scroll down for links to the project and to the programme which funded it. For more information on ICT Results, access the articles online using the URL provided at the end of the text.

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## EVENTS

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## Coordinating biomonitoring research across Europe

*A synchronised human biomonitoring research project, one which involves researchers from all over Europe, is an ambitious project to implement. A coordinating tool using EXCEL software was designed to help with the optimisation of the resources designated to such an effort.*

The European environment and health strategy (2003) estimated that some 20 % of the burden of disease in industrialised countries would be attributable to environmental factors.

There remain many significant gaps in our knowledge as a society of cause and effect relationships between health impacts and environmental sources of stress. Human biomonitoring is the analytical tool which is used to assess the impact on humans of exposure to environmental pollutants. The health implications of chronic exposures and interaction with different pollutants are monitored using biomarkers. Indicative data collected from biomarkers is considered essential to the formulation of an integrated health and environment strategy.



The ESBIO project set in motion the development of a coordinated approach for human biomonitoring. Its particular focus was on children in Europe. The overall aims included: the creation of an updated and extended inventory of activities and databases; the coordination of proposals for a pilot study and the design of a protocol for laboratory coordination.

As part of the study, a group of researchers created an EXCEL tool in which different parameters can be applied to calculate the total necessary budget for several different study approaches. This tool is necessary in order for the project partners to be able to perform a socio-economic optimisation for any future human biomonitoring pilot projects.

In order for the best results of such a pilot project to be obtained, the number of participating EU Member States needs to be at the maximum level possible. At the same time, the scientific processes and principles involved should be optimised and costs kept low without impeding implementation. Different work levels need to be accounted for also. This coordinating tool takes all these parameters into account.

Funded under the FP6 cross-cutting activity 'Research for policy support'.

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

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## Identifying genetic factors in diabetes complications

*Testing haplotype effects in association studies (Thesias), one of the most complete software packages for defining haplotype associations in unrelated individuals, has been upgraded and extended. Besides new functionalities, a graphical interface has been added to guide the user through each logical step of the association analysis.*

Haplotype information inferred from genotypes can be of great interest to scientists working on unveiling the role of candidate genes in the aetiology of diabetic nephropathy. This microvascular complication in individuals with type 1 and type 2 diabetes is likely to be the consequence of sequence variations in several genes in combination with unfavourable environmental factors.

Within the framework of the Euragedic project the association of single nucleotide polymorphisms (SNPs) in candidate genes with overt diabetic nephropathy was tested in large independent patient cohorts. To differentiate the true effect of polymorphism

from what is due to its linkage disequilibrium with other functional variants, haplotypes were used as markers.

When investigating unrelated individuals haplotypes however need to be statistically deduced. For this purpose dedicated tools have been developed to infer information about single nucleotide polymorphisms (SNPs) on chromatids that are statistically associated. At the Institut national de la santé et de la recherche médicale (Inserm) in France, researchers have implemented maximum likelihood methods for haplotype-based association analysis of phenotypes in Thesias software.

New logistic regression models were implemented into the Thesias software to allow users to define associations between haplotypes and phenotypes characterising the severity of diabetic nephropathy. Selection of genotypes and phenotypes can be made through scroll lists accessible through the graphical user interface, while further options are provided through check boxes.

The Thesias software package which includes documentation and example data files is freely available at <http://genecanvas.ecgene.net>. The source code written in ANSI C is also available upon request for researchers interested in developing their own batch mode program.

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

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## Trait specific genetic markers in ryegrass

*Scientists developed a trait specific marker tool kit to identify ryegrass (Lolium perenne) genes affecting forage quality and stress tolerance. This new knowledge benefited both public institutions and private companies involved in breeding high-quality forage grasses.*

The aim of the GRASP project was to develop trait specific sets of single nucleotide polymorphism (SNP) markers. An SNP is a minute variation that occurs in the DNA sequence which can be used as a marker. A marker is a segment of DNA whose position on a chromosome can be identified and whose inheritance can be followed. They can be used to track the inheritance pattern of

genes which have not yet been identified but whose approximate location is known.

Knowledge of novel techniques developed through the GRASP project was transferred to crop breeding companies and public institutions. A wide range of relevant traits in ryegrass was identified. Carefully selected markers and genes were monitored for allelic differentiation as a result of the applied selection regime. A set of simple sequence repeat (SSR) markers, repetitive stretches of short sequences of DNA, were evenly distributed throughout the genome and used in genotype profiling.

Researchers evaluated nine different methods for detecting and identifying trait specific SNPs. The methods were assessed according to repro-

ducibility, cost per SNP and speed. Researchers concluded that an overall recommendation could not be made. The choice of which SNP detection method to use depended to a large extent on the purpose of the experiment being carried out. For each trait, a set of possible key genes was isolated by the project's different partners. An SNP was detected using one or more of the nine different methods. A statistical analysis was then employed to assess the distribution of alleles among the selected and control populations.

The results enabled scientists to establish an association between specific marker alleles and different traits. This information, together with a collection of protocols for application in the laboratory, was made available to all members of the consortium. All the traits tested showed allele specific marker/trait associations. Traits included rust resistance, water-soluble sugar content, nitrogen use efficiency, seed yield and tolerance to cold, heat, frost, shade and the tilting of soil.

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

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

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## New gene vehicles for the journey to Streptomyces

*Protein production using bacteria as factories has vast potential. A European research team has developed a cloning vector able to transfer selected genes for production in Streptomyces.*

The extraction of proteins from fungi and bacteria for use in food production, pharmaceuticals and a huge range of other industrial applications has expanded rapidly in just a few decades. Gemini, an EU-funded project, researched the optimal production of plant cell wall degrading enzymes for use in the laundry business.

Genes selected to produce the required proteins must be transferred to an appropriate bacterium using a vector. This process makes use of the conjugation process whereby DNA is transferred between connecting bacteria on a genetic structure, a plasmid. Additionally, other genes can be added promoting processes like cloning and incorporating characteristics such as antibiotic resistance.

Using state of the art genomic techniques, project partners at the Katholieke Universiteit in Leuven, Belgium, successfully developed a conjugative *E. coli*/*Streptomyces* vector. Genes involved in replication and transfer of DNA material from the two bacteria were incorporated including origin of transfer (oriT) gene from the broad host range vector RK2.

Further refinements included minimisation of the vector size and inclusion of a multiple cloning site which allows easy replacement of important control genes including promoters and signal sequences. An additional feature was the resistance gene to the antibiotic apramycin.

A major advantage of this new protocol is that all genetic manipulations can be per-

formed in *E. coli* which cuts operational time. Overall, the scientists have developed a novel conjugative vector that can still be transferred to *Streptomyces* by conjugation. *Streptomyces* is an ideal production site for correctly folded recombinant proteins and therefore has advantages over *E. coli*.

Development of a flexible vehicle for passage of genes into an efficient production site for novel forms of cellulase expression has direct application in the laundry industry. Reducing the required temperature for washing has obvious energy saving applications. Moreover, progress in vector development can benefit the biotechnology industry generally.

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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### 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

## Interferon-a responses in acute phase of swine fever

*Outbreaks of classical swine fever in pigs exact a high cost in the agricultural sector. Partners in the 'Immunological mechanisms of protection against classical swine fever virus' (IMPCSF) project have researched into the role of interferon-a (IFN-a) in the pathogenesis of the disease.*

Any outbreak of classical swine fever is accompanied by harsh measures to contain the spread of the virus. These include a ban on pig movement and mass culling. The attendant economic and social consequences of these measures on the farming community can be devastating. In response to this, the EU-funded project IMPCSF

channelled its resources into the development of vaccines that can offer early protection against the causal virus and the prevention of horizontal transmission.

One strand of this research was the investigation into the effects of high IFN-a production during the acute phase of infection. This is accompanied by severe lymphopaenia, a severe depletion of peripheral blood B and T lymphocytes. The extent of this unwelcome reaction is directly related to the virulence of the strain of the virus.

The Swiss-based team at the Institute of Virology and Immunoprophylaxis also investigated the IFN-a response in immunologically naïve and vaccinated pigs. In highly immune animals, after vaccination with the c-strain of the virus, no IFN-a response was detectable.



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This indicated that measuring the IFN-a response after the challenge infection of immune pigs was a good indicator of the efficacy of the vaccine. Other conclusions that can be drawn from this research are that ideally, a vaccine should be able to prevent viral replication altogether and therefore prevent IFN-a responses.

One other important implication of these findings is also pertinent in other haemorrhagic fevers, including dengue and rift valley fevers. The strength of the IFN-a response is related to the severity of the clinical outcome. Furthermore, it is known from other studies that high IFN-a levels are accompanied by haematological disruption. However, IFN-a plays a crucial role in the innate immune response. Therefore, to modulate the extent of the IFN-a response would have therapeutic possibilities.

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

Collaboration sought: information exchange/training.

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## Comparing stroke rehabilitation centres across Europe

*In order to evaluate the differences which exist between care professionals and the amount of therapy delivered to patients, observations were made and analysed by researchers in four stroke rehabilitation centres based in different European countries.*

The experience of a stroke seriously alters the life of that person. An attack can be serious or mild, in more severe cases it can leave a person seriously disabled, paralysed on one side or make them lose their ability to speak. A mild stroke may leave a person experiencing minor problems like weakness of an arm or leg.

Rehabilitation and adequate therapy following the experience of a stroke gives patients and their families hope and dramatically improves their quality of life. However the level of treatment received varies considerably. It is for this reason that the EU-led Cerise initiative conducted a longitudinal study which examined the impact of rehabilitation on the pattern of recovery after a stroke.

Four rehabilitation centres across Europe made up the case studies for the research, which examined several aspects of recovery at the time of discharge from the centre,

2, 6 and 12 months on, following a stroke. The type and amount of therapy was documented and analysed.

One part of the study focused on discerning the differences across Europe in the amount of therapy received by patients. In each of the four centres, 60 randomly selected stroke patients were observed at 10 minute intervals on 30 separate days also chosen at random.

The results showed that out of the participating centres located in Belgium, Germany, Switzerland, and the United Kingdom, important differences in the use of time could be identified. Patients in the United Kingdom spent, on average, only one hour in therapy per day. This was significantly less than in Germany and Belgium where the average was two hours a day. In Switzerland it was deemed that patients spend on average three hours a day in therapy.

Most surprising was the finding that patients overall spent less than half their time in interactions and more than 70 % of their time in non-therapeutic activities.

The researchers concluded that the differences which existed between the centres seemed to be more dependent on management decisions than the number of staff available. These results and others have been disseminated on the project website [http://faber.kuleuven.be/onderzoek/dep3/neuro/cerise/mission\\_statement.htm](http://faber.kuleuven.be/onderzoek/dep3/neuro/cerise/mission_statement.htm)

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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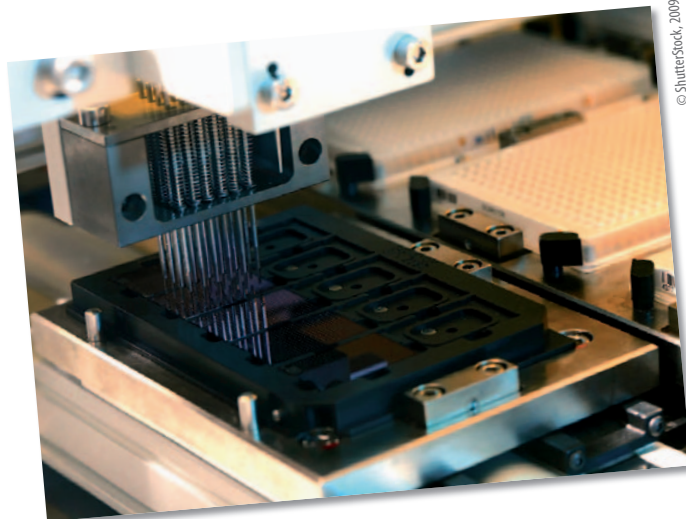


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## Key regions mapped for bowel disease genes

*Researchers have investigated the genetics of inflammatory bowel disease (IBD) using cytogenetic methods. The scientists applied the resources from global human genome databases, cloning and genomic techniques to then characterise the mutations discovered.*

The development of IBD is due to a complex mix of modern lifestyle environmental influences combined with a genetic predisposition. Linkage studies have indicated a polygenic basis with markers identified on chromosomes 6, 12 and 16. Characterisation of the genetic basis for the ailment would help to simplify the diagnosis of the disease.



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The EU-funded project 'Genetics of IBD' aimed to further elucidate the genetic basis of the disease. Specifically, scientists at the Panum Institute, part of the University of Copenhagen, used cytogenetically based techniques to map genes linked with IBD. Well-established mapping methods involving disease-associated balanced chromo-

sosome rearrangements (DBCRs) were harnessed to identify potential susceptibility loci.

When chromosome pieces move position to another chromosome or invert within the same chromosome, they potentially inactivate a gene at the break-

point. Using this principle together with the 'Mendelian cytogenetics network' and other human genome project databases, the scientists identified several breakpoints where loci were potentially associated with IBD susceptibility.

To map the breakpoints found with potential IBD genes, genomic techniques were employed. Fluorescent in situ hybridisation (FISH) was used along with more than 80 bacterial artificial chromosomes (BACs). The bacterial constructs were used to amplify the relevant regions of DNA. Also, further verification for IBD associated genes at one breakpoint was sought using haplotype association testing.

The use of conventional cytogenetic techniques married with state of the art genomics and proteomics has helped to identify the genetic status of this complex disease. Further research is required to map and characterise genes and unidentified messenger RNA revealed by this research. By validation of genes associated with this complex disease, novel targets for therapeutic purposes and screening tools can be identified.

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

Collaboration sought: information exchange/training.

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## Uncorking the functional food potential of wine

*The difference between a good and a bad wine is a matter of chemistry. Scientists have evaluated winemaking methods in terms of the polyphenolic content of the wine and its impact on wine flavour, colour, nutritional content and body.*

The presence of polyphenolic compounds in wine affect the colour, taste and mouthfeel of a wine. The drying effect of red wine for example is the effect of a glut of tannins. The mouth feels dehydrated even though the salivary glands are still operating normally.

In an attempt to produce the perfect bottle of wine for a variety of markets, the EU-funded project Maxfun researched into the chemical analysis of wine and the associated enzyme-linked extraction processes. As the target chemicals are often present in the skin of the fruit, fermentation with the peels as in red wine can yield more of the taste-linked polyphenols in the product.

Project partners at the University of Wageningen in the Netherlands focused on extraction methods and treatments. The berries blackcurrant and bilberry were tested for their predisposition to produce polyphenolic compounds and other compounds that would elevate the juice and wine to the status of functional foods.

As a first step, analysis of the flash release treatment proved it produced phenolic compounds in larger amounts and at a faster rate. Trials regarding storage, being an important aspect of final wine quality, revealed that the chemistry of the wine had not changed with respect to tannins but that anthocyanins and flavonols decreased dramatically.

Gamma linoleic acid, acclaimed benefits of which include reduction of atherosclerosis and rheumatoid arthritis was found to be in high concentration in blackcurrant. Bilberries had a high yield of polyunsaturated fatty acids generally and tocotrienols, members of the vitamin E group.

The cutin concentration, insoluble fibre with a potential role in prevention of carcinogenesis was also analysed. Most of the cutin was found to be in non-ester linked polymers. Consequently, more than 90 % was resistant to

ester-degrading depolymerisation in the berries. In contrast, 70 % of apple cutin yielded monomers using this extraction method.

The data from this research highlights the need for production methods to be tailored to fit the biochemical composition of the fruit behind the wine. Further research may not only yield a very good bottle of wine but one that is fortified naturally for its health-promoting qualities.

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

Collaboration sought: information exchange/training.

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## Smart fabrics make clever (medical) clothing

*European researchers have developed a smart fabric that can monitor muscular overload and help prevent repetitive strain injury (RSI). But that is just the beginning. The team is also exploring a pregnancy belt to monitor baby's heartbeat, clothing to help coach hockey, and shirts that monitor muscle fatigue during training.*

Smart fabrics promise to revolutionise clothing by incorporating sensors into cloth for health, lifestyle and business applications. In the long term, they could consist of circuits and sensors that provide all of the typical electronics we carry around today, like mobile phones and PDAs.

Current, first-generation applications are far more modest, and pioneering medical smart fabrics are used to monitor vital signs like heart rate and temperature. But two crucial hurdles — unobtrusiveness and reliability — impede widespread adoption of such clever clothes.

Now one European research team has developed groundbreaking medical-sensing smart fabrics, and its work could lead to pregnancy monitoring belts, sports clothing that provides training tips, a wearable physical game controller and a vest that helps to prevent repetitive strain injury.

The Context project initially sought to develop an RSI vest to tackle a serious work safety issue. Repetitive actions can, over time, lead to permanent injury and the problem costs billions of euros a year. It affects over 40 million workers across the continent and is responsible for 50 % of all work-related ill-health.

The team had to tackle three challenging problems. First, they were using a relatively novel sensor that demanded sophisticated electronics located in the clothing. Second, they were aiming to measure muscle contraction, a very 'quiet metric'. Third, they were venturing on a research path seldom trod: muscle contraction as a predictor for

stress. Long-term, low-key stress is the leading risk factor for RSI.

'Each of the issues was very difficult. We chose to use a capacitive sensor, because it does not need to be attached to the skin, like resistive sensors do, which adds to the comfort. It needs controlling electronics close to the sensor to work effectively, and that presents a real challenge for textile integration,' explains Bas Feddes, Context's coordinator.

Similarly, measuring electromyography, or electrical activity in the muscle, is more subtle and tricky than electrocardiography, which measures the heart. The rustle of clothing caused by movement can drown out the signal. Context has gone a long way to solving that problem but it is not as robust as they would like.

Finally, medical understanding of muscle stress as a predictor for RSI is not a mature field of research, so it is difficult to say with certainty that specific activities could lead to RSI. Despite these hurdles, the team successfully designed an RSI vest, and they are currently improving its reliability.

Context's ambitious programme tackled pioneering and very complex issues in smart-fabric research, which resulted in a useful, unobtrusive and reliable RSI vest that can warn wearers to take a recuperative break.

More importantly, perhaps, the work was finished on time and under budget, so Context has scope to explore other potential applications enabled by the system. The team is eager to extend this work. 'We

also have some ideas for improving bio-feedback for the prevention of RSI problems, and we will pursue them as well,' notes Feddes.

But other applications may prove even more compelling in the short term. For example, the team is looking at a pregnancy belt to monitor a baby's heart rate. 'In the short term, this would be more of a lifestyle application,



rather than a medical one, but that work could lead to a belt that helps monitor difficult pregnancies,' Feddes believes.

In the meantime, parents could enjoy the peace of mind monitoring their child's heartbeat, perhaps with a heart-shaped light keeping the rhythm. But reliability will be paramount, suggests Feddes, as false warnings could be nerve wrecking for parents.

Muscle stress during sports training is another potential application, and one consortium partner will pursue a swing-monitor for hockey players. 'Hockey coaches find it difficult to give feedback to their players, so they would be very interested in clothing that details the path of their stroke. The shirt would track the order in which muscles engaged during the swing. It is an application that could apply to golf, too,' Feddes explains.

One of the most interesting and intensively investigated applications is a physical game controller. Controlling a computer game by wearing a garment that continuously probes your muscle activity is attractive, not only because of the fun-factor but also because it promotes exercise by children.

The garment again requires the expertise of all partners to develop the sensors, and integrate them into the textiles, and to measure and interpret muscle activity.

'It is an interesting area with many potential applications and the project partners were very engaged so we got a lot of work done. We would like to pursue other areas together in a future project, if possible, and we will be discussing potential research areas over the coming months.'

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## Prompt primer toxin test for cheese

*Histamine is a source of food poisoning in fermented foods. Scientists from the EU-funded project Decarboxylate have developed a sensitive rapid method of detection for the amine and the identification of the bacterium responsible.*

Histamine food poisoning can occur when taking in fermented food or drink produced by lactic acid bacteria (LAB). Certain strains of LAB are positive for histamine production because they possess the necessary gene sequences for transcription of the enzyme histidine decarboxylase (HDC). This cata-

lyses the conversion of the amino acid histidine to histamine. Histidine is present in high levels in cheese, poultry and wheat.

Previous to this research, tests for the presence of HDC positive (HDC+) LAB took about a day to give results. Standards and competition in the food industry mean that this is an unacceptable length of time. Project partners in IPLA-CSIC, took up the challenge to develop a quick accurate test for the bacterium in cheese and its unwanted metabolic product.

The basis of detection was the production of replicated primers for the gene sequences for histidine



decarboxylase. These were obtained from a range of LAB that produce histamine. The scientists then used high-performance liquid chromatography (HPLC) to identify levels of the biogenic amine. Not only was the test sensitive, but 96 samples could be run simultaneously and results take only about two hours.

Because of the gene sequence specificity, this test can be used to eliminate strains of bacteria that are HDC+ so the production of histamine is not possible in the food. Although the tests here involved histamine production in dairy produce, LABs positive for the enzyme involved from other sources were detected in the course of the study. This means that the test could be extended to other fermented food and drinks.

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

Collaboration sought: licence agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4485

## Effect of adjuvants on Ochratoxin A content in wine

*An investigation was undertaken into the risk posed to consumers by the fungal toxin Ochratoxin A (OTA). In order to control OTA, corrective measures were developed for use during the storage and processing of the grapes.*

OTA contamination occurs in grapes and is particularly prevalent in the countries of the Mediterranean basin. OTA can cause kidney damage in humans. The 'Wine-ochra risk' project carried out a risk assessment of OTA and developed protocols and systems for controlling the toxin and the fungi which produce it.

Trials were carried out with different adjuvants, which are added to wine to enhance it, as well as different quantities of each adjuvant. The 'Wine-ochra risk' study used five differ-

ent red wines with different levels of OTA and exposed them to different fining agents. Finings are added during wine processing to remove organic compounds in order to improve, clarity or to adjust the taste or aroma.

Results of the study indicated that products which contained charcoal were effective in reducing the level of OTA in wine. However, when the concentration of OTA was high, it could not be reduced to acceptable limits through the use of any of the fining agents. It was also revealed that when OTA levels

were low, less charcoal should be used so that the colour of the wine was not affected. If the OTA content was high and a large amount of charcoal was used, the intensity of the colour of the wine could decrease.

A number of bacterial strains were also investigated for their ability to reduce levels of OTA in both wine and must. Various commercial strains of *Oenococcus oeni* were tested. The best outcome was achieved by strain R4, which was similar to that produced by a variant of *Lactobacillus plantarum*.

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 > 4408

## Understanding lactic acid bacteria

*Fermentation is a key chemical process in the preparation of food stuffs, made possible through the action of lactic acid bacteria (LAB).*

The EU-funded Decarboxylate project set out to improve understanding of the decarboxylation steps involved in fermentation. It is known that decarboxylation of different substrates can result in either health-promoting or toxic effects. Decarboxylation of amino acids for example results in the production of bioorganic amines, with deleterious effects.

Identification of LAB unable to produce bioorganic amines thereby demonstrating

resistance to acidic stress were the aims of the project. The metabolism of citrate by LAB is beneficial in many ways and can also result in the inhibition of growth of many pathogens. As outlined earlier, the strains of LAB that can carry out these processes can be very useful within the food industry.

Project partners worked on developing models to demonstrate the specific role of citrate metabolism in LAB. In particular, they focused on how citrate metabolism can

affect acidic stress resistance in LAB. The data of the studies indicated that improving the ability of bacterial strains to transport citrate from the surrounding environment could improve their acid resistance profile. The research provided a number of additional insights, which could lead to the selection of new LAB strains with more favourable profiles.

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 > 4737

## Optimisation of dairy cattle protein diets

*Scientists have formulated new rationing matrices and incorporated them into existing commercial models to optimise utilisation of dairy cattle protein supplements.*

Scientists from the EU-funded project Novazote aimed to formulate new feed descriptors and assess diagnostic tests to optimise the use of protein supplements for the dairy industry. Specifically, the team based at Premix Especialidades Agrícolas e Pecuárias Ltd in Portugal worked on new rationing matrices for raw materials to incorporate in novel protein feed systems.



The new feed information included the amino acid content of undegradable protein and the effect of supplementation on rumen buffering capacity, acidogenicity value (AV) of the main protein, forage and energy sources. These data were incorporated into the rationing software.

The team found that the amino acid profiles of microbial protein produced in the rumen were not constant as previously thought. The final duodenal amino acid profiles were affected by many variables. The phase of the associated bacteria, whether the residues were from a nylon bag or original feed source as well as yeast supplement presence could all be significant factors.

The scientists also researched the formulation of diets that best approximated the amino acid profiles of milk protein without the use of EU-prohibited sources like fish meal. This proved difficult with currently allowed protein material. The resultant decreased efficiency of utilisation and oversupply of

amino acids carries with it the danger of deamination and excretion. This is undesirable because of environmental nitrogen pollution. The use of rumen protected amino acids was found to be an answer and improved the balance of amino acids absorbed.

The partner's work also suggested that a high protein feed may increase the buffering action in the rumen. This avoids the deleterious effects of acid that include damage to the rumen wall itself. AVs of maize silage, protein, energy sources and dietary ingredients that do not ferment were recorded in terms of final pH.

Finding the best feed composition in an industry crucial to the EU agriculture industry carries many important implications. Economically, it means cheaper food costs for the producer with consequent lower imports. From a societal point of view, there will be less environmental pollution and an increased standard of living for farmers and rural economies.

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 > 4709

## Cost-effective livestock traceability

*Researchers in Barcelona, Spain, as part of the EU-funded project 'EID + DNA tracing', have identified the best way to introduce advanced traceability techniques to European livestock at the lowest possible cost.*

The ability to trace a bad product to its source is crucial when trying to limit the impact of an outbreak of food poisoning. However, achieving this feat is easier said than done when the product in question is meat.

The passage of European Council Regulation (EC) 21/2004 regarding the identification of sheep and goats gave new impetus to such efforts. In turn, the 'Life quality' programme

sponsored research investigating the technical and financial feasibility of solutions based on electronic identification (EID) and molecular markers such as DNA.

The project coordinator, the Universitat Autònoma de Barcelona, used computer-based models to estimate the costs of various options to the European livestock industry. Sheep, goats, pigs and cattle were considered over a wide range of scenarios.

The Catalonia-based scientists found that the economics varied significantly depending on the type of animal, the size of the farm and equipment costs. In general, the larger the animal the greater the cost. The analysis revealed that the most cost-effective solution turned out to be using EID in combination with more traditional identification systems.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4731

## Preventing falls through training

*A fall prevention program targeting the elderly population has been developed in order to enhance mobility in daily life.*

The mainstreaming of elderly citizens in everyday life is ever increasing. Mobility is an important factor affecting quality of life for all sectors of the population including the elderly. In light of this, the Eurokinesis project has focused on ways to increase individual mobility in the elderly by concentrating on active, preventative measures as opposed to passive means.

One of the ways this was approached was through examining fall prevention by targeting those who are at high risk of falling. Essentially, ways to train elderly individuals who suffer from particular movement disorders to effectively avoid unexpected obstacles and stumbling was explored in laboratory conditions.

In light of this, the effects that low-intensity exercise programs have on falls, standing

balance, balance confidence and obstacle avoidance were examined. Results showed a significant reduction in the number of falls and may prove useful as a supplement to previously reported effective interventions.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4767

## Lighting up the way to controlled fish puberty

*The phenomenon of precocious puberty in farmed fish causes significant losses in production levels. The EU-funded project Pubertiming investigated the hormonal and cellular basis of testis development under different light regimes in salmon.*

Photoperiod management is frequently used as a tool for the manipulation of biological systems in farming situations. Milk production, seedling growth and sexual development are examples of processes that can be improved as a result of light control. As production losses in aquaculture are significantly high due to premature puberty, extensive research has been committed to the elucidation of the mechanisms behind sexual maturation.

Project partners at the Institute of Marine Research in Norway monitored the extent of testis development under different experimental conditions. Fish were subjected to constant light (LL) and natural light (NL) conditions. The different cellular stages, germ and Sertoli (nurse) cell, during sperm development were studied. The extent of proliferation and apoptosis were used as indicators of development and inhibition of

puberty respectively. At a molecular level, an antiserum against a protein present in the G2 phase up to the mitotic (M) stage was used as a mitotic marker.

One result was that sexual development in terms of spermatogenesis indicated by proliferation of Sertoli cells and spermatogonia occurred when levels of androgens were still low. This indicates that the hormone follicle stimulating hormone (FSH) is probably responsible for initiation of spermatogenesis. Subsequent high levels of proliferation were under the control of the androgen 11-ketotestosterone (11-KT) in both LL and NL groups.

Data from this research showed that proliferation was a strong indicator of testis maturation. Information was disseminated from scientists to aquacultural concerns through scientific journals and conferences. The ultimate aim of the research was the development of new lighting protocols for the fish farming 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 > 4720

## Effect of fishing on species diversity

*Fishing has an effect on the marine ecosystem beyond the particular species being targeted. Therefore, theoretical models were developed to show the impact of trawling on biodiversity.*

The Mafcons project studied the effect of trawling on fish and bottom-dwelling invertebrates in order to identify areas of ecological disturbance. The Mafcons project drew up management protocols for predicting the effect of particular catch quotas on species diversity in the marine environment. These were then added to the current International Council for the Exploration of the Sea (ICES) fisheries management advice process for fisheries managers.

Developing and testing an ecological model to underpin these management protocols demanded a thorough understanding as to how fishing activities impact on the marine ecosystem. Therefore, the relationship between statistical models and actual ecological impact was carefully investigated.

Fish are more mobile than bottom-dwelling invertebrates and are therefore distributed in a different way through the water column. For this reason two separate, but complementary, methods were applied. The

final result was two modelling methods that used fishing data to calculate mortality for fish and benthic invertebrate communities.

The resulting data was used to create maps showing areas of ecological disturbance. This was then used to test Huston's dynamic equilibrium model, which considered the effect of disturbance on species diversity. The model related fishing activity to the level of mortality for both target and non-target species in a given area and over a set period of time.

The invertebrate model was used to determine mortality rates from each fishing event for a range of bottom-living organisms. This allowed the total mortality rate for bottom-dwelling species to be calculated for each area fished. The fish

mortality model used areas fished and local density to determine the number of fish caught each time. The model also gave the fishing mortality rates for each species recorded. The total catch in each study area was used to give a figure for the exploitation rate. This was found by dividing the total catch by estimates for the abundance of each fish present.

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 > 4747



## The best genetic markers for herring conservation

*In order to develop sustainable management strategies for our endangered fish stocks, their populations must be identified using appropriate genetic information. Scientists have now identified markers that can enable the accurate recognition of distinct populations of herring.*

Population study and the precise definition of a population depend on many factors. For the Atlantic herring, *Clupea harengus*, the identification of a distinct reproductive population is complicated by the seasonal intermingling of distinct demographically separate stocks.

Under the auspices of the EU-funded project Hergen, a research team at Göteborg University, Sweden, aimed to revise the criteria used for the identification of separate breeding stocks. The importance of this is that the incorrect identification of spawning stocks can result in their overexploitation and consequent loss of intraspecific genetic diversity.



The scientists made use of genetic markers instead of the conventional means based on spawning behaviour or meristic (morphological) traits. For the scientists, there were four distinct genetic sources

from which markers could be isolated. These were allozymes, mitochondrial DNA (mtDNA), small repeating sequences from nuclear DNA (microsatellite DNA) and major histocompatibility complex (MHC) genes associated with the immune system.

To select the most appropriate source of markers for further research on the Atlantic herring, fish samples were collected at five different sites over two successive years in the Baltic, North and Skagerrak Seas. There was little agreement between the population markers. This is probably to be expected as they can differ in relation to selective forces, mutation rates and level of presence of more than one form of the gene (heterozygosity level).

From the data collected, microsatellite DNA was associated with population structure at a highly significant level. Furthermore, it coincided with the geographic separation between the three seas under study. Use of microsatellite data then would seem a good basis for further research of Atlantic herring and the much-needed conservation of spawning stock.

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 > 4650

## Body measurements for identifying origins of cod

*Scientists developed a pan-European diagnostic model for identifying the population origin of cod. The different methodologies developed were used to determine the location of spawning and of harvest of individual fish during different times of year.*

The aim of the Codtrace project was to enable customers to avoid fish from specific over-fished populations or from areas suffering from harmful algal blooms. The technique was also able to distinguish between wild and farmed cod.

Researchers used a database comprising nearly 40 000 different measurements of 1 318 individual fish to characterise the external body structure of Atlantic cod during its growth. The relationship between size and shape was investigated for a number of variables and a linear model confirmed that both age and geographical origin significantly affected body shape. Age was found to have a greater effect than origin.

Variance in body size, mainly as a result of growth, accounted for 95 % of the morphological variation. Although the geographical component which affected morphology was low, almost 100 % of cod could be individually traced to one of the eight sea

basins within their range. Fish from some geographical populations could be placed more precisely than others. Cod over five years old could be assigned to their place of origin with 100 % accuracy.

Morphological data standardised using allometric growth functions for every size variable was less effective for use in geographical assignment than data that was in addition analysed separately for every single year class. Allometry is the study of the relationship between size and shape. Researchers used dual control for ontogenetic shape transformation including the analysis of otoliths, structures from the fishes' inner ear, which can be analysed to estimate age. The other control was the size adjustment of raw data to assign individual cod to geographical populations.

When the age of the fish was known, year classes allowed fish to be assigned to a particular geographical population even without size standards. Within the system of measurements used for each fish, most body size variables were related. However, the distance between the eye sockets and the length of the back of the head retain a certain degree of independence from the other measurements.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4701



## Babies learn music while sleeping

*Early screening and treatment for infants with hearing problems, and the ability to computer-generate musical scores, are two very different possible outcomes of some 'off-the-wall' research.*

Until recently, little has been known about the perceptions humans have when they enter the world. Although adult perception has been extensively researched, how, or even if, the brains of newborn babies perceive patterns in the world remained a mystery.

That mystery has been at least partially solved by an EU-funded research project, EmCAP, which brought together what many would consider an unlikely consortium, comprising both neuroscientists and music technologists.

What project coordinator Susan Denham describes as 'blue-sky thinking' on the part of her and her colleagues when they initially proposed the project led to experiments involving playing music to newborn babies.

In the experiments, sleeping babies were hooked up to an encephalograph (EEG), an instrument able to measure brain activity using electrodes placed on the scalp. The babies were then played music — to be more exact, simplified tone sequences — to test what sort of patterns they were sensitive to and whether they would predict what was coming next based on what had gone before.

'The babies were presented with sequences of sounds of different tone colour — different musical instruments, if you like — but all of the same pitch. Occasionally, you play a sound of a different pitch and watch the EEG to see if they produce a distinctive reaction to this deviant sound,' explains Denham. Similar tests were done to see if babies were sensitive to rhythmic and melodic patterns, too.

Denham says while this sort of technique has been used for many years on adults to measure pre-conscious detection of unexpected events, it has seldom been used with newborns. The big advantage is that it can work even when somebody is unconscious. So the babies being asleep was not a problem.

The results were exciting, demonstrating newborns had a sense of pitch from birth, and this was not something learned through experience as had previously been thought. The experiments showed they are even sensitive to the beat in music.

'The bottom line is we come into the world with brains that are continually looking for patterns, and telling us when there is something unexpected we should learn about,' says Denham.

István Winkler, who conducted the baby research, concludes this capability allows babies to learn about their environment and the important actors within it.

The discoveries may be applied to developing early screening techniques and treatments for cognitive hearing problems. The screening currently in use simply measures how hard of hearing people are as opposed to the nuances of their actual perceptions.

'Research is needed to determine the norm — and how much variation there is from it — to prevent false diagnoses when a baby is simply developing slowly,' Denham says. But then it should be possible to spot defects at a very early stage and treat them while the brain is still malleable.



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The research has thrown new light on music cognition and brought practical benefits to the music technologists involved in the project. 'While it remains unclear whether a capacity for music is rooted in nature, rather than nurture, it is clear that musical competence is a special human capacity, shared across ages and cultures,' says project partner Henkjan Honing.

Although the ability to detect musical patterns is present from birth, music cognition develops throughout life. However, music cognition is influenced not so much by musical expertise, as by experience. According to Honing, 'frequent listening to a certain musical genre allows listeners without formal musical training to become experts in that musical style.'

Details revealed by the experiments about the way the brain checks and adjusts its expectations made it possible to develop computer programs that mimic these processes.

Researchers in EmCAP developed a generic algorithm, basically a bit of smart software, able to detect violations of expected pitch and rhythmic structure, with tonality soon to be added to the list.

'We did the modelling at two levels, one trying to emulate brain function and perception in a simplified but still fairly detailed way, and the other tailored more for practical use in music processing systems,' Denham says.

What this will mean in practise is the future development of artificial cognitive music systems able to 'listen' to music and produce a score in real time showing which instruments play which notes. Project partner Xavier Serra suggests that the next generation of music processors will be based on algorithms that imitate how humans process music.

Further projects are planned on the back of EmCAP, including one starting in March 2009, which will use sounds to detect behavioural patterns of living creatures.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90421>



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## Improving our knowledge about child kidney disease

*Paediatricians in Poland worked with children suffering from chronic kidney disease in an effort to gain insight into the evolution of the disease and its potential treatment.*

The 'Life quality' programme funded a group of over 30 universities, medical schools and hospitals to study chronic kidney disease (CKD) in children. The Children's Memorial Health Institute (CMHI) in Poland, a participant in the 'Escape\_trial' project, led an investigation on a number of important arterial parameters.

The first phase of research involved comparing these parameters in children with CKD against those of healthy children. A range of CKD stages were examined, from early onset to dialysis to recent renal transplant

(Rtx) recipients. In total, nearly 400 children were tested.

High-resolution ultrasonography was used to measure the intima-media thickness of the carotid arteries (cIMT), femoral superficial artery IMT (FSA IMT), vessel wall cross-sectional area (WCSA) and lumen cross-sectional area (LCSA). CMHI discovered that the values of all parameters were greater in CKD patients versus their healthy counterparts. Furthermore, they determined that onset of the disease was accompanied by a rapid increase in cIMT.

Another question CMHI sought to answer was whether treatment had any impact on these parameters. Their approach was to measure the same parameters one year after having established an initial baseline with the CKD group. Remarkably, Rtx patients exhibited significant improvement, that is shrinkage, in both cIMT and WCSA. These indexes worsened over time for the rest of the group, particularly the children on dialysis.

Finally, CHMI performed a statistical analysis to identify factors that could be used to predict cIMT in advance, such as total dialysis vintage.

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.

<http://cordis.europa.eu/marketplace> > search > offers > 4827

## Endocrine disruptors and early puberty in girls

*An investigation was carried out into endocrine disrupting chemicals (EDCs) and their ability to affect the hypothalamic-pituitary (HP) unit causing precocious sexual development in girls.*

Some EDCs have a similar in vivo effect to that of oestrogen and might interfere with the process of puberty in females. It was hypothesised that the early onset of puberty observed in some girls migrating to the EU might be due to previous exposure to EDCs. Scientists from the EDEN project carried out studies in rats to determine sensitivity to EDCs and their effects, including the insecticide dichlorodiphenyl-trichloroethane (DDT).

The researchers studied induction of precocious activation of the hypothalamus unit, using the rat hypothalamic explant incubation method. This technique was used to uncover novel molecular mechanisms for precocious activation. Additional studies were undertaken to outline animal models for describing the phenomenon in vivo.

A combination of in vitro and in vivo analyses demonstrated that EDCs, including

DDT isomers, can stimulate the secretion of the gonadotrophin-releasing hormone (GnRH) in the immature female hypothalamus. This was achieved through both rapid and/or slow effects, involving oestrogen and dioxin pathways. This could account for the early onset of puberty in observed young females following early exposure to the sex hormone oestradiol or DDT in vivo.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4844

## Immunoregulatory cells aid allergic disease therapy

*Novel DNA vaccines have been developed and tested as a therapy for allergic reactions to the house dust mite and pollen. As part of this research, the inhibitory action of T regulatory cells and mesenchymal stem cells on allergic response was investigated.*

The quest to find effective therapies for allergic responses to allergens like the house dust mite and Parietaria pollen remains a major goal within the biopharmaceutical industry. One avenue of research has seen the development of allergen encoding DNA vaccines.

The overall goal of the EU-funded project AllDNAvac was to measure the effects of the vaccines on the effector cells involved in the allergic response. As a separate but related approach, Italian-based project partners at the University of Firenze investigated the suppression mechanisms of T cell responses with two types of immunoregulatory cell. The aim was to test the effectiveness of natural T regulatory cells and mesenchymal

stem cells (MSCs) to be used in association with DNA vaccine therapy.

Purified from the post-natal thymus, the natural T regulatory cells were found in vitro to down-regulate the interleukin-2 receptor in target T cells. They also suppressed the activity of Th1 cells and to a lesser extent Th2 cell clones.

In addition, the action of mesenchymal stem cells on immune response was investigated. This class of adult stem cell, progenitor in nature, have immunoregulatory properties. In the presence of interferon-gamma (IFN-gamma), they had an anti-proliferative effect, not only on T cells but on so-called natural killer cells that are a part of the innate immune system.

Effective DNA vaccines for allergy therapy will no doubt improve public confidence in this particular technology. This will enable the European biotechnology industry to be more competitive by producing safer vaccines at lower costs.

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 > 4549



## Investigating the burden of disease in the elderly

*An interdisciplinary report was created which covered conclusions and recommendations regarding the burden of disease in the elderly population.*

The elderly population is often faced with the burden of disease, particularly in regards to disability. In an effort to heighten awareness and provide recommendations, the Burdis project has utilised data resources and investigated existing gaps in the disabling process as people age. Involved in this are perspectives which range from a variety of disciplines and thus cover a range of angles such as physio-

logical changes, hereditary versus environmental factors and gender differences.

Through reputable cross-sectional studies and updated methodology, a report was conducted which synthesised the collected information regarding disability of individuals in their later years. The report provides conclusions across various sectors of old age disabil-

ity as well as recommendations for research, practical work and policy-making. The report was planned for dissemination in various EU Member States and was also made available in electronic form. In addition to the elderly population, governmental and voluntary health organisations as well as policy-makers may find this report useful.

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 > 4766

## Improving upon mobility perception in the elderly

*Optic flow perception in the elderly was tested in the Eurokinesis project in order to evaluate and provide solutions to an individual's diminishing mobility faculties due to ageing.*

Elderly citizens play a more active part than they used to in the EU's economy and society. Their mobility is integral to them remaining independent and getting on with their everyday lives. It is for this reason that this study has highlighted the importance of

researching the defects leading to difficulties in movement perception in the elderly.

The project examined the physiological, pathophysiological, behavioural and ana-

tomical factors in humans and non-human primates, to describe the psychological and organic deficits which lead to difficulties in movement perception.

Optic flow perception in the elderly was consequently tested. These psychophysical tests

were conducted using virtual reality simulations where optic flow stimuli of different strengths simulated forward self-motion in different directions.

The results showed that the older subjects who were tested were not capable of achieving better performance from higher information content and therefore could not process the information flow the way the younger participants could.

The findings of this project could have future design implications. For example, the results could support the design of head-up displays in vehicles; such displays should present a reduced amount of information and be very conspicuous.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4825

## System for incontinence management

*Researchers at Brunel University in the United Kingdom have developed a system to ease the difficulties of urinary incontinence.*

Urinary incontinence is not a rare condition. It is estimated that some 200 million people are affected worldwide. The options available to cope with the consequences however are very limited. Pads offer a non-invasive approach but are bulky and can develop odour. For those with mobility problems, the use of absorbent pads necessitates the employment of a carer for changing, thus reducing independence further. Internal catheters are associated with urinary infections and erosion of the urethra.

Under the auspices of the NICMS project, scientists at Brunel University have developed a non-invasive system to avoid the use of these two traditionally used methods. The

NICMS liquid handling unit is essentially a portable unit carried in a remote position from the user's body. It consists of a secure container and a small interface with integral sensor that can be worn all day. Alternatively, for those who are aware of the need to urinate, a slimline urinal can be accommodated inside loose clothing.

The system has been patented and the prototype tested in six European countries. Evaluation questionnaires were compiled, distributed through partners and collected after completion by the user and or carer. Ratings of good or satisfactory were given by 74 % of users while 24 % deemed it to be poor. Problems identified mainly related

to the prototype nature in that the interface was too small and difficult to position. Other negatives were lack of reliability and noise. However, positive feedback sources said the urinal was viewed as easy to remove, clean, comfortable and kind to skin.

Improvements after feedback from the survey were planned and included reduction in size, weight and noise made. The system overall has potential to make the lives of incontinent people a lot more comfortable and independent from care givers.

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; venture capital/spin-off funding.

<http://cordis.europa.eu/marketplace> > search > offers > 4727

## Lighting up the lives of the elderly — adaptively

*Artificial light affects us in subtle ways. At its best, ambient lighting can relax, soothe or excite, but used poorly it can drain us of energy and disrupt sleep. What if lighting could adapt automatically to meet our individual needs?*

The result, say a team of European researchers, would be an improvement in the general wellbeing of anybody who spends long periods in artificially lit buildings, particularly the elderly and the infirm, but also factory and office workers.

‘Studies have shown that the quality and type of lighting can have a significant impact on our health and comfort,’ explains Edith Maier, a researcher at Vorarlberg University of Applied Sciences (FHV) in Austria.

Maier coordinated the EU-funded Aladin project which brought together academic and industrial partners from Germany, Italy, Hungary, Austria and Romania to develop an innovative ambient lighting system that adapts intelligently to individual needs and wishes.

The system uses information from biosensors worn by the occupants of a room or building to determine what users are doing and then changes the lighting accordingly. The researchers’ goal is to use the technology to improve the wellbeing of the elderly, people suffering from age-related illnesses and people with reduced mobility, many of whom spend a lot of time confined indoors.

‘Poor lighting can accentuate existing vision problems and reading difficulties among the elderly, it can cause depression and disrupt sleep cycles,’ Maier says. ‘By automatically adapting the lighting in a room to what people are doing, many of these psychological and physiological problems can be reduced.’

Most adaptive ambient lighting systems in use today do not take individual needs and activities into account. They rely

instead on a preset-time cycle to brighten and dim during certain periods of the day. In contrast, the Aladin system uses data from sensors in a glove worn by users to measure their heart rate and skin conductance response — the electrical resistance of the skin which goes up during periods of activity and down while at rest. Fed wirelessly into a control system, the bio-data lets the system know automatically when to switch between a brightly lit ‘active setting’ and a more subdued relaxation mode.

‘If someone is trying to concentrate on a task, such as reading a book or sewing, the light in the room will intensify, but if they are simply relaxing or trying to sleep it will dim,’ Maier explains.

And just as a sunny day brightens our mood, the system could be used to gradually awaken users to a cool, bright light in the morning so they get up feeling refreshed, and lull them to sleep with a subtle glow in the evenings. The system settings can be changed by users via an easy-to-use interface accessed through a TV screen and remote control.

The Aladin researchers are also studying ways in which different intensities and colours of light can be used to assist mobility in a building, such as by automatically highlighting obstacles and dangers. ‘This could be particularly useful for people suffering from dementia who can easily become disorientated,’ Maier notes.

More than a hundred people participated in a series of lab and field tests conducted in Germany, Italy and Austria. The trials showed that elderly people quickly learnt how to use the system and, over the course of three months, experienced improvements in their general wellbeing, including less trouble reading and less disturbed sleep patterns.

Though the prototype system was designed to be installed in a single room in a private home, Maier believes



that the real market for the technology is in care homes and residential buildings built specifically for the elderly.

One reason is cost. Building and installing each prototype system costs between EUR 10 000 and 12 000, and even taking into account economies of scale Maier expects a commercial version to run to EUR 5 000 for an individual installation. On the other hand, in a large building, such as a block of apartments or a care home, the price of the installation per resident would be reduced considerably.

With Europe’s population ageing, many more care homes and elderly residences are being built, creating a large market for technologies that can improve the quality of life for elderly people and keep them active and less dependent on others for longer.

Maier sees the Aladin system initially being used as part of building management systems that control not only lighting but also temperature, communications and safety. She also sees potential for the concept to be used in factories and offices to help improve the productivity of workers and even in vehicles to help keep drivers alert and awake.

‘Because the Aladin system is built using an open and modular architecture it can easily be integrated with other systems,’ the project coordinator notes.

Project partners are currently in talks with several lighting companies with a view to developing the Aladin prototype into a commercial product. They plan to showcase the results of their work to an international audience at the ‘Human-computer interface international (HCII) conference’ in San Diego, United States, in July 2009.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90417>



## Need-based approach to care for the disabled

*Special efforts focusing on the approach and services of caregivers and health professionals have been made in order to help provide a better quality of life for people with disabilities.*



Unfortunately people with disabilities do not always receive the information and health and social care required. This may occur because perception by professionals does not necessarily meet the actual needs. Therefore the Infopark project sought to resolve this issue with a complete understanding of the nature of a disabling illness through empirical research as well as personal views and experiences. The aim was to improve patient quality of life through more independence.

The research was conducted on 500 elderly (and their lay carers) with varying physical, mental and social disabilities, cultural, social and economic backgrounds. The views gathered were then compared to those of 700 professionals in seven Euro-

pean countries. In fact, a critical mass of knowledge was obtained which can be used for the support, services and care of the disabled.

More specifically, interviews were conducted with people suffering from Parkinson's disease and their family caregivers. Additionally there were focus group discussions with 291 health and social care professionals. There were many positive outcomes from these efforts. Respondents found practical advice most helpful and the favoured approach was one-on-one interactions with a specialist doctor who was able to explain information in a clear straightforward manner. Furthermore opening the channels of communication was deemed a recognisably positive step toward future progress.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4659

## Bone regeneration supported by intelligent scaffold

*A team of scientists in the EU-funded project Intelliscaf have developed synthetic scaffolding material for use in bone repair and regeneration.*

Life expectancy is still increasing but unfortunately organs and tissues are not able to withstand the corresponding increased level of activity demanded of them. For repair of connective tissue like bone, cartilage and skin, grafting techniques are usually not fully successful in restoring their complex set of functions.

One answer is to induce the formation and growth of the tissue in vivo. The demands on the necessary scaffold material are high. Not only must it be able to provide a tem-

porary replacement for the injured tissue but it must also be able to support the subsequent tissue regeneration. This is a complex biochemical recipe composed of progenitor cells and cell adhesion factors all orchestrated by the correct molecular triggers. Finally, after the job is done, it must degrade in line with tissue regeneration and differentiation.

The two most promising bone-producing scaffolds produced by project partners — the University of Twente in the Netherlands and

the Danish Technical Institute — are both biphasic calcium phosphate ceramics. They are produced from tricalcium phosphate (TCP) sintered with hydroxyapatite at temperatures ranging from 1 150 to 1 120 °C.

Under in vivo tests, the scaffolds demonstrated the induction of bone production intra-muscularly and then showed a high degree of bone formation subsequently. Intelligent scaffolding material for bone repair means the ageing population can look forward to a quality of life unimpaired by creaking painful bones.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4713

## Living substitute for injured meniscus tissue

*Recovery takes time and it is rarely complete, as many thousands of Europeans undergoing treatment for injuries to the knee meniscus will testify. A novel material composed of the patient's own cells has been developed to help the regeneration of the knee joint meniscus and provide lifelong relief from further knee degeneration.*

Meniscus injuries resulting from trauma or osteoarthritis can ultimately lead to the destruction of articular cartilage and loss of the knee joint function. Until recently, the standard repair method included complete resection, which was likely to result in subsequent injuries to the cruciate ligament making a total knee replacement necessary. A tissue engineering approach to meniscus reconstruction, involving control techniques

for ex vivo growth of living tissues on three-dimensional scaffolds was therefore adopted to offer a better solution.

Within the 'Meniscus-regeneratio' project, a novel bioengineered meniscus reconstruction material composed of autologous meniscus cells was developed. Meniscus cells taken from the patient were seeded on a three-dimensional construct made of



biocompatible and biodegradable materials. Such a scaffold provided not only optimal conditions for cell proliferation but also sufficient mechanical strength for surgical handling.

continued on page 19

## Wood waste to provide medical benefits

*Knot-wood often proves to be the bane of wood processing in mills, as it requires additional attention and resources to process. However, its potential for other industries such as the biochemical industry has been explored through Cerberus, an EU-funded project investigating the multi-faceted exploitation potential of knots and wood bark.*

Knots that form in wood have been found to possess extractives that can serve as a protective measure against possible cell and tissue damage. As such, both knots and wood bark are a viable source of bioactive compounds, the exploitation of which is only lately being explored. Their removal from wood prior to pulping can therefore provide cost reduction benefits in terms of reducing the bleaching, water and energy of pulping requirements.

The project developed a pre-pulp extraction process and conducted large-laboratory scale tests. Depending on the tree type, the removed knots can be utilised as a source for lignans and other polyphenols. Test showed that on average 6 t of lignans could be extracted from

1 100 t of knots per year of *Abies alba* wood. Another result of pre-removal prior to pulping is that the resulting process produces brighter pulp with fewer dark specks.

In tests conducted to identify further advantages of pre-extraction, it was shown that especially in poplar, common oak, fir and pines, bark waste was rich in flavonoids. Flavonoids are commonly known for their antioxidant activity — having strong benefits in treatments for cancers and heart disease. *Populus deltoides* possesses two strong antioxidants of which approximately 10 kg can be extracted from every ton of wood.

With these potential all-round forms of exploitation, utilising the extraction produc-

tion process makes sound financial sense. It also provides both the paper mill and the medical industry some healthy alternatives for their waste product. With further research, additional benefits may be identified, giving new value to products that are usually waste material.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4695



## 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-funded 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 possible 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-throughput 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 end-point of the PCR as is con-

ventional, 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

continued from page 18 'Living substitute for injured meniscus tissue'

To obtain scaffolds with controlled micro and macro porosity, polycaprolactone (PCL) and hyaluronan-based polymers were processed by a composite phase inversion and salt leaching technique. Moreover, ultra-fine biodegradable synthetic fibres (of either polylactic acid (PLA) or polyglutamic acid (PGA) polymers) were used as reinforcement. In vivo results demonstrated the possibility to regenerate meniscus tissue by

using such a scaffold loaded with articular chondrocytes. This initially maintained its structural behaviour and more importantly, allowed cellular in-growth by acting as a carrier of growth factors and drugs.

Patents have already been taken out for the general principle of using polymers in tissue engineering applications. At the end of the project, the partners planned to carry

out the follow-up research needed before marketing a product.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4754

## For accurate electrical measurements

*Applying their knowledge of the magnetic properties of ferrite materials, engineers at Enterprise Ireland worked on the development of a new class of devices for the measurement of electric currents.*

Ferrite materials, such as cobalt ferrite ( $\text{CoFe}_2\text{O}_4$ ), undergo small changes in their physical dimensions when exposed to a magnetic field. These magnetostriction distortions were largely of theoretical interest until a few decades ago and have found only a few practical uses in the past.

The IELAS project partners however recognised that magnetostrictive materials might supply the solution they sought for reducing the size of current measurement transformers. These devices are widely used to ensure the proper operation and therefore the safety of electrical power distribution systems from the electrical power station right through to the point of use.

Contrary to conventional inductive transformers with a copper coil wrapped around a core of ferromagnetic material, the system proposed by the IELAS project partners was essentially based on 'active' materials. Magnetostrictive materials were used to gen-

erate mechanical waves under the alternating magnetic field induced by the primary current to be measured.

More specifically, pure cobalt ferrite was chosen because of its lower electrical conductivity and the possibility that it offers for optimisation of eddy current losses. Standard solid state processing appeared to be a viable route for the preparation of rods of cobalt ferrite from a compound mixture of cobalt oxide and iron oxide powders.

Firstly, the ceramic powder was uniaxially compacted into a disc shape. A maximum density of less than 90 % was achieved by means of isothermal ramping and single dwell time sintering. The density of the cobalt ferrite disc was estimated to be 96 % after applying a combination of rate-controlled and two-step sintering.

Cylindrical rods of pure cobalt ferrite were fabricated by introducing the ceramic powder into rubber bags which were isostatically pressed at room temperature to a density of approximately 92 %. These cylindrical rods of 100 mm length and 20 mm diameter would be used in the transmitter of the current measurement transformer.

The mechanical waves generated at the transmitter flow through the piezoelectric material of the receiver, where they can be converted into electric waves. An electric unit was used to amplify the receiver's signal and allow for the precise measurement of electric currents even in high-voltage circuits.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4773



## Silent airfoils for wind turbines

*Scientists used an innovative approach which combined aerodynamics with noise prediction techniques to develop silent airfoils for the blades of wind turbines.*

Although there is a growing interest in the use of wind energy, noise from wind turbines represents a major obstacle to greater uptake. The main aim of the Sirocco project was to reduce by 3 to 6 decibels the aerodynamic noise from the turbines' rotating blades. Researchers achieved considerable reduction in noise levels without any corresponding loss of power performance. Improvements were made by applying a new approach which combined aerodynamic and acoustic design techniques.

The work undertaken was based on the earlier EU-funded DATA project, which designed acoustic blades for a model turbine

in a wind tunnel. The intention of the Sirocco project was to extend this work to a full-size turbine. The turbine's performance was validated using a new measurement technique, which was capable of localising and quantifying noise sources from a rotating blade.

The Sirocco project aimed to lower the level of noise originating from wind turbines by improving the aerodynamic flow at the trailing edge of the blades. A significant reduction in noise levels would result in greater public acceptance of wind energy.

Calculations of aerodynamics and for predicting noise were improved as a result of

detailed experiments on boundary layers. This is the layer of air immediately next to the blade. These improvements greatly improved the ability of researchers to accurately predict the level of noise generated by the airfoils trailing edge. The airfoil is the shape of the blade in cross section and its aerodynamic and aeroacoustic properties were verified in a wind tunnel. The work carried out by the Sirocco project has enabled silent, high-performance airfoil sections to be developed for the wind turbine industry.

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 > 4638

## Using elastic waves to measure current

*Electrical engineers in Spain discovered a better way to measure current. Both electricity producers and consumers across Europe stand to benefit.*

The IELAS project received funding from the Growth programme to experiment with new ways of measuring current. The idea was to use mechanical waves as opposed to the current approach, which involves monitoring changes in magnetic flux.

The Universidad Pontificia Comillas, a Spanish member of the IELAS research consortium, helped design and construct a prototype. The heart of the system is a current sensor, itself composed of an emitter element,

a transmission structure and a receiver. When current is passed through the emitter element, its magnetostrictive components produce mechanical, or elastic, waves.

These elastic waves subsequently propagate to the receiver through a dielectric coupling structure. Piezoelectric materials in the receiver convert the elastic waves into an electrical signal, which is then amplified and processed to produce an accurate reading of the original current's strength.

The Universidad Pontificia Comillas has protected the technology developed during IELAS with a patent. Their hope for the future is to phase out current transformers based on conventional technology in favour of the elastic wave approach. The potential for significant savings in equipment weight, volume and, above all, production costs has already been identified.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4753

## Designing vibration out of large wind turbines

*An RTD project sponsored by the EESD programme demonstrated the ability of a new technique to extract different aerolastic turbine modes from signals provided by sensors attached to the wind turbine.*

Large wind turbines offer economies of scale in terms of energy production, but can suffer from vibrations. In certain circumstances these vibrations can cause instabilities and reduce power output. A group of wind turbine experts gathered in the context of the Stabcon project to study this phenomenon in detail.

The approach involved the installation of strain gauges on the tower, shaft and blades of a 2.5 MW wind turbine operating in the field. Data were gathered from the sensors over a wide range of operating conditions. Afterwards, scientists with the Risoe National Laboratory in Denmark, the organisation coordinating Stabcon, applied

operational modal analysis (OMA) to the time series of data.

The decision to implement OMA bore fruit, revealing two distinct tower modes as well as two whirling modes, which are caused by edgewise blade vibrations. Furthermore, the choice of a fixed frame of reference facilitated the detection of natural frequencies. However, modes deriving from flapwise blade vibrations proved undetectable with OMA due to extensive damping.

Despite the requirement for ample data, the methodology was ideal because it did not require a pri-

ori knowledge of the wind turbine nor the external forces acting on it. The Stabcon results will be exploited to revise design guidelines in an effort to limit the impact of these modes on wind turbine performance.

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

Collaboration sought: further research or development support.

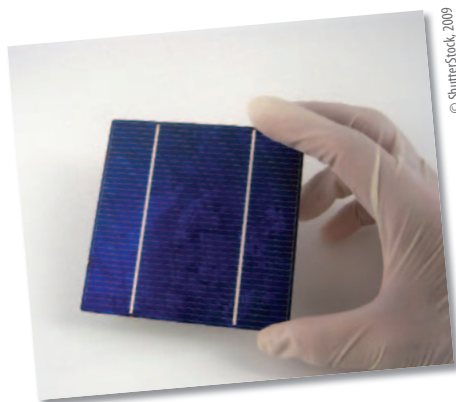
<http://cordis.europa.eu/marketplace> > search > offers > 4548



## Improving solar cells

*Solar cell research has investigated novel techniques aimed at improving the overall efficiency of solar panelling potential for multicrystalline silicon (mc-Si) cells. The processes also aimed to develop low-cost industrial protocols for these super efficient cells.*

The EU-funded project Topsicle identified three major processes in order to improve



solar cell technology manufacture. The first of these methods, a single-step selective emitter used porous silicon as a diffusion barrier. However, during the cleaning step that occurs before diffusion, when the silicon is removed, it was found that further research would be needed to thicken the porous layer and to increase its sheet resistance.

The second method, fine-line printing, was developed in an effort to produce low shadowing losses. At the same time the fingers also had to maximise high finger conductivity. Through repeating the process of printing and drying it was possible to achieve fingers of 60  $\mu\text{m}$  in width and height. When compared to standard

printed cells it was found that this method produced a 0.5  $\text{mA}/\text{cm}^2$  higher current.

The third method looked into the angle buried contact which is a front metallisation process that resulted in minimum shading. Layering the metal in angled grooves presented a 0.7  $\text{mA}/\text{cm}^2$  increase in the short circuit current. Ideally, the metal grooves are not visible when viewed from a perpendicular angle to the cells' surface.

It is hoped that with these developments and further research, the Topsicle project will raise Europe's competitive edge significantly within the industry, and furthermore, reduce the energy pay-back time for such mc-Si based photovoltaic systems.

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 > 4740

## The potential of Europe's lagging rural regions

*Having conducted in-depth audits of the activities which make up the economic and social structure of several rural regions in Europe, researchers made their recommendations which outlined ways to achieve more effective and sustainable tourism development.*

The Sprite project looked at ways in which the potential of Europe's lagging rural regions could be fulfilled. An overall assessment was made of the composition of the regions; this included a description of activities, products and community structure. Twelve study regions located across Europe were selected. Fol-

lowing these in-depth audits, recommendations were made outlining measures for more effective and sustainable integrated tourism development.

As part of the audits, detailed assessments of resources and activities took place. A two-tiered database was compiled. The first level was descriptive; it was concerned with economic, social, cultural, human and community resources as well as environmental categories. The second level was evaluative, drawing upon the concepts of endogeneity and complementarity. A matrix was drawn up; this theoretical model was structured around networks, embeddedness and empowerment.

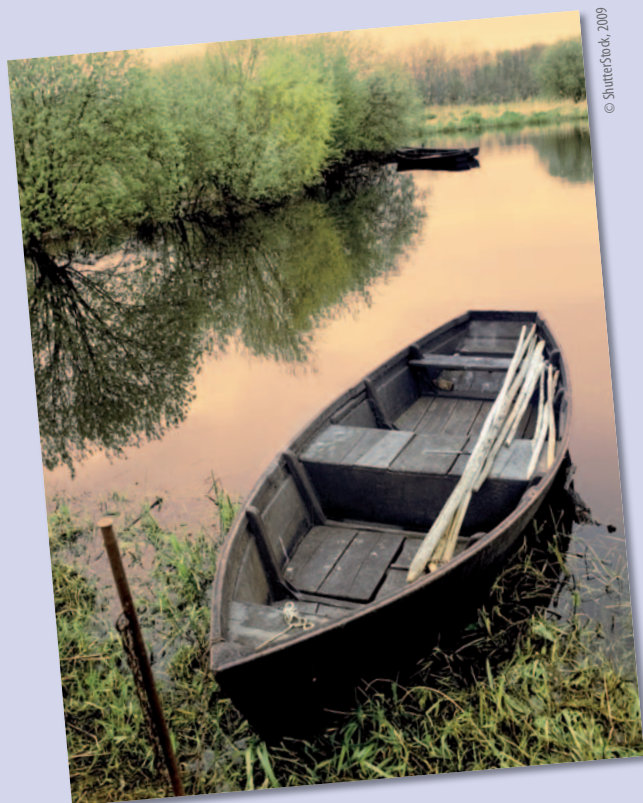
The conclusions drawn from the audit revealed the potential for tourism development across the regions studied. On the theme of sustainable tourism, it was considered that there is potential to increase tourist numbers without damaging the environmental and socio-economic resources, as long as expansion is managed properly.

Overall recommendations were also made. To establish good governance, the support of strong, inclusive, horizontal networks between communities and interest groups was advised. Other proposals were the support of equitable vertical networks between local actors and exogenous interests and sources of capital and to make better use of existing cultural resources. It was also recommended that investment in capacity building and awareness-raising were conducted and to use target marketing to increase visitor numbers and lengthen the season.

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 > 4738



## New strategy for landslide early-warning systems

*Innovative research work has begun within the European OASYS project on the next generation of landslide forecasting methods that could result in a significant increase in warning times.*

Landslides, along with floods are the most widespread natural hazards on Earth, responsible for property damage, injuries, as well as deaths every year. The havoc of landslides is felt more acutely in parts of the world without extensive ground networks monitoring landslide-prone areas. Exploiting a variety of new advanced observations from space, scientists have discovered a new opportunity to build early warning systems.

The interdisciplinary project OASYS was funded by the European Commission to build on the tremendous progress made in remote sensing deformations of the Earth's surface. The ultimate aim was to exploit the full potential of space and airborne systems, providing high-

resolution data for detailed mapping of fault and slopes in the landscape. Moreover, a multi-scale observation approach, which would be able to delineate high-risk areas step by step, was adopted in order to develop a reliable and effective monitoring system.

Areas of active and potential landslides had been identified by integrating high-resolution satellite data and aerial photographs with geological maps. The next step was to install a regional geodetic monitoring network that would provide the essential geometrical and topographic information needed to develop an advanced deformation analysis algorithm. The final step was to add high-precision instruments, such as inclinometers and extensometers that

would be in operation continuously and could support a real time alert system.

Exchange of information among project partners played a key role in integrating new techniques for data analysis with established and more traditional methods for forecasting purposes. Importantly, a more accurate estimation of landslide hazards and risks was required for the development of a standardised and early warning system that could support national and local authorities. Future projects will derive significant benefits from the expertise that OASYS partners gained through practical experience of combining remote sensing with geologic and tectonic data.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4736

## Digital tree mapping for precision spraying

*New technologies are expanding the range of pesticide application tools enormously. The term 'precision agriculture' can be used to describe many of these tools, and can include the technologies developed within the 'Preci spray' project.*

Precision agriculture tools were specifically developed by the 'Preci spray' project partners to be able to reduce the amount of pesticides applied to orchard trees. By matching the volume and direction of the spray to the tree foliage shape and volume, pest control materials could be saved. Moreover, the promise for both economic and environmental benefits could be realised.

The introduction of information technologies to orchard management led to the development of a high-precision system for sprayers. To define the amount of pesticides that match each tree's needs, the locations and shapes of all trees in the orchard need

to be mapped accurately in three dimensions. The sprayer automatically controls the direction and volume of spraying on the basis of all the information collected. More specifically, the sprayer nozzles can open or close and their distance from the target vary, while moving between rows of trees.

Tree-mapping and guidance data, for this purpose, are obtained from stereoscopic aerial surveys over the plantation by applying automated image processing and photogrammetry techniques. Aerial triangulation is used to determine accurate space and ground coordinates of any premarked point. These values provide the informa-

tion needed to reference individual photogrammetric stereo models to data obtained earlier in the growing year and compile tree shape and volume maps.

These updated maps, combined with additional management data are passed to the sprayer as a work plan. The spraying vehicle finds its location in real time by means of satellite navigation systems. During the development and testing of this high-precision spraying system, valuable insight was gained in the positive contribution of technical solutions to tree health and protection of the environment.

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; venture capital/spin-off funding; private-public partnership.

<http://cordis.europa.eu/marketplace> > search > offers > 4764

## Micropropagation protocol for the European ash

*The Kinsealy Research Centre of the Teagasc Agriculture and Food Development Authority in Ireland researched how to reproduce trees in a laboratory setting.*

The European or common ash (*Fraxinus excelsior*) is not easily propagated by traditional agricultural methods. This is one reason its exploitation as a source of timber products has been limited, but research funded by the 'Life quality' programme sought to change this outlook.

The Teagasc Agriculture and Food Development Authority coordinated a group of more than 10 partners during the RAP project. A detailed in vitro protocol for the micropropagation of the European ash was one of the major deliverables of the project.

Zygotic embryos were harvested and cultured on Murashige and Skoog (MS) medium. Early

growth was encouraged by plant hormones, specifically 2,4-dichlorophenoxyacetic acid and benzyl adenine, as well as proper light and temperature conditions. Rapid maturation to the cotyledonary stage was achieved by transfer to clean MS medium followed by several weeks of low-temperature storage. The resulting plantlets were then switched over to Lloyd and McCown woody plant medium and relocated to a humid greenhouse for further development.

The somatic embryogenesis procedure created and refined during RAP offers the opportunity to mass produce European ash in a short period of time. Another advantage of the protocol is that it can easily be incorporated into

schemes that target the genetic improvement of the European ash. Teagasc and its RAP partners are moving forward with these results.

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 > 4629



## Propagating and preserving the best European ash

*The 'Life quality' programme funded a team of forestry experts to identify and preserve important genetic information for the European ash, an essential component of forests spread across the continent.*

During the RAP project, a high quality stand of European ash, *Fraxinus excelsior*, located in north-western Germany was selected by the Lower Saxony Forest Research Institute (LSFRI) for micro-propagation. Shoot tips and axillary buds were removed, sterilised and established on woody plant medium.

Further to experimentation, the LSFRI came up with an effective concoction of plant growth stimulants to encourage re-

generation. Similar tests revealed the most successful rooting medium combinations depending on the type of cutting. Vitality rates reaching up to 100 % were achieved during the subsequent transfer of the plant material to greenhouses, which was aided by the application of arbuscular mycorrhizal fungi.

The project also investigated the potential for storing prime genetic material using the

cryo-preservation technique, where in vitro samples are chilled to sub-zero temperatures. LSFRI scientists developed both the cooling and warming protocols, in which media, temperatures and other parameters are specified, culminating in excellent recovery rates.

All successfully propagated cuttings were planted in the Lower Saxony region. The knowledge acquired during the project will be used to ensure the future of the European ash.

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 > 4611

## Testing for a better sylvan industry

*The ash is a native tree to many parts of Europe but current ash tree populations suitable for reforestation however are too few. The import of seed from abroad must therefore be considered and an EU-funded project RAP has evaluated what potential impact these non-native trees will have.*

As a hardwood tree, the ash is especially favoured as an indigenous tree to the Flanders region due to its economic value. It is often cited as a potential candidate to replace the widely used poplar tree especially in areas where afforestation is to occur. In order to ensure the imported seeds present no genetic threat to the native endemic populations, provenance testing was conducted.

Ecological demand for the restoration of indigenous forest has caused the forest management industry to reevaluate the trees they should grow, but not necessarily

only in financial terms. Early assessment of imported seed performance conducted in nurseries reveals that seed-specific criteria play a vital role. For example, stage of seed collection, storage, transport and nursery conditions may all affect how the seeds perform.

Tests were conducted in order to assess non-native suitability with regard to local growth conditions. It was intended that a list of suitable recommended proven-

ances would be drafted in order to benefit local governmental and private foresters.

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 > 4571



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## Useful genetic material from waste water treatment plants

*The Gemini project chose a highly unusual setting, namely that of a waste water treatment plant to search for valuable microbes. The results were highly encouraging.*

Micro-organisms play an important role in many global cycles and have repeatedly been exploited for the benefit of mankind. The Gemini participants, working with funding from the 'Life quality' programme, aimed to discover new microbes for use in industrial as well as medicinal applications.

Biologists with the University of East Anglia (UEA) helped establish metagenomic libraries from bacteria sourced from different stages of treatment at wastewater treatment plants (WWTPs). A key element of the

Gemini approach entailed the use of a wide host-ranging cloning vector rather than just the standard organism — *Escherichia coli* (*E. coli*).

In total, approximately 200 000 gene fragments were isolated, each with an average insert of 25 kilobases (kb). Several of these cosmids were found to generate noteworthy phenotypes. For instance, some promoted resistance to antibacterials while others enabled the production of tryptophan, an essential amino acid.

The work was supplemented with additional metagenomic libraries derived from samples obtained from activated sludge in a batch reactor. More specifically, around 400 000 longer cosmid sequences known as fosmids with an average insert of 40 kb were isolated. Other advantageous traits relating to the synthesis of pigments and the degradation of plant hormones were discovered in these libraries.

The UEA and its Gemini partners are following up on these promising findings.

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.

<http://cordis.europa.eu/marketplace> > search > offers > 4818

## Sustainable waste management for mushroom producers

*The 'Spent mushroom substrate' (SMS) project successfully introduced the reuse concept to the mushroom industry, significantly improving the outlook for waste management.*

The 'Life quality' programme funded the Spanish firm Micelios Fungisem S.A. to lead a research project aiming to improve the sustainability of mushroom production. Working with eight other organisations from Ireland to Israel, Micelios Fungisem investigated the possibility of reusing casing soil (CS), also known as spent mushroom substrate (SMS).

CS is the medium upon which mushrooms are grown. One of its main ingredients is peat moss, which is increasingly costly to

produce and transport. Used CS also constitutes a major waste management issue for mushroom producers. Therefore, developing a process to regenerate used CS could substantially reduce production costs as well as the environmental footprint of the industry.

Micelios Fungisem and its partners employed leaching to remove potentially harmful mineral salts from the spent CS. The end result was a reduction of electrical conductivity by a factor of 10 and neutrali-

sation of the pH of the CS. The second step involved heating the CS to 65 °C for one hour in order to destroy any dangerous microorganisms.

Following pasteurisation, the renewed CS was combined with other composting materials. Its performance was subsequently gauged in comparison to that of new, unused CS, whereupon no decline in mushroom quality or yield was detected. Further to these encouraging results, Micelios Fungisem and its partners are looking to sell the technology to other mushroom producers.

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 > 4688

## Plankton blooms reveal sea surface history

*Understanding climatic changes and the impact that various factors can have has led a group of researchers in the 'Method to characterise alkenone composition' project to investigate alkenones as a proxy for assessing and measuring sea surface temperature.*

In order to use alkenones in this manner, a more refined method to determine their chemical composition had first to be developed. This entailed finding a means to locate their double bonds. As such cyclopropylamine was used as a derivatisation reagent and was found to provide high-reaction yields, high gas chromatography (GC) retention times between derivatives and precursor compounds, and practically no by-products.

With this method it is now possible to assess alkenones from *Emiliania huxleyi* blooms extracted from the sea sediment and then analyse both the ancient and modern samples. By determining that the isomers had their double bonds located in the same region relative to the carbonyl group was an important discovery. It implies that there is a good uniformity in alkenone mixtures regardless of the age of the sample. Hence

it reinforces the relationship between alkenones and sea surface temperatures.

With the above observations, it is intended to extend the knowledge base of decadal information to a century scale. This will improve scientific data and be especially important for predicting changing weather cycles. Moreover, in studying plankton blooms it is possible to determine and validate climatic models.

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 > 4741

## Modelling the migration of cod

*The pattern of migration and the effects of prey density of cod were examined via the aid of individual-based models (IBMs) to assist in cod stock management and protection.*

In order to evaluate the management procedures involved in protecting cod stocks, a heightened understanding of the horizontal and vertical movements of the fish was necessary. As such, the Codyssey project examined these movements as well as the impact that environmental factors have in order to enhance prediction of individual movements and seasonal distribution.

In order to achieve this, two IBMs were created. The first examined the vertical migra-

tion of cod using a bioenergetic swim bladder model. The model can pinpoint best tilt angles and swimming speed according to the buoyancy of the fish. With the use of a genetic algorithm, it can apply the effect of behavioural factors. Simulations and sensitivity evaluation using a variety of environmental agents were conducted. Additionally, predicted vertical migration patterns were compared to various observations and to data gathered from cod tagged in the Barents Sea. Exploration continued in order to

establish the model according to other ecosystems so that a comparative analysis could be possible.

The second predator-prey IBM was created so that the effects of prey density and relative value of time spent in the pelagic compared to the benthic water layers could be examined. The IBM general description and the initial findings were submitted for publication in the *Bulletin of Mathematical Biology*.

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 > 4671

## Tracing Atlantic cod to their place of origin

*A new multivariate classification scheme for the Atlantic cod is a valuable tool for the sustainable management of important fish stocks in European waters.*

University College Dublin (UCD) led a research project entitled Codtrace dedicated to developing traceability techniques for the Atlantic cod (*Gadus morhua*). Samples of wild and farmed cod were collected and subjected to a variety of morphological, chemical and genetic analyses.

In total, nearly 400 pieces of data were produced for each cod. The challenge for UCD and its partners was to make sense of the sizeable dataset. The first step involved determining the maximum predictive power for each of the variables individually. When averaged over different seasons and locations, body morphometry indicated the correct harvest location nearly 85 % of the time. Parasite and bacterial assemblages also provided excellent results.

However, no single attribute proved capable of correctly tracing the cod 100 % of the time. This prompted UCD to construct a multivariate classification scheme, combining a number of traits rather than relying on a single piece of information. Essential to this process was the reduction of the size of the dataset through the use of probabilities.

More specifically, following classification as either wild or farmed cod, the individual's characteristics were subjected to multinomial logistic regression. The resulting model was able to correctly pair the cod with its

location of origin 100 % of the time. UCD and its Codtrace partners are following up on these promising results.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4721



## The adaptive capacity of regions

*A changing tourism sector requires that regions be adaptive if they are to continue to prosper. This is particularly the case in rural regions, say researchers who were part of the IDARI project.*



The IDARI project analysed the problem of falling levels of tourism in Europe's rural areas. Tourism forms an integral part of the economy in many regions; this is especially the case in those areas with exceptional natural beauty.

The study presented a novel analytic framework from which socio-ecological resilience could be investigated. The study found that the nature of the emerging tourism sector differed between regions. In particular, some regions focus on a specific tourism activity. In other cases, different types of activities are fostered and supported.

The research team discovered that there was a general pattern, indicating that more diverse tourism

helps maintain or increase the resilience of the region to negative change. This can also be described as the 'adaptive capacity of regions'.

A number of factors were identified which play a part in this adaptive capacity. Social memory and social networks were particularly important. Skilful leadership of local elites and administrators were also important factors. This is especially so in the case of regions where the distribution of power in the community is very uneven. In these cases, the local elites protect each other to form a system with little permeability to outsiders.

Recommendations were made following the study. It was suggested that adaptive governance systems are needed to assist the progress between different interests.

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 > 4696

## Shining the light on solar purification

*A great deal of research and innovative thinking has resulted in the development of a solar-driven, autonomous means to decontaminate drinking water. Solwater, an EU-funded research project, has developed a photocatalytically generated detoxification system.*

The system, based on the principles of disinfection and decontamination evolved from within the project, has been improved by introducing fixed catalysts of titanium dioxide ( $\text{TiO}_2$ ) and ruthenium  $\text{Ru(II)}$  complexes. The  $\text{Ru(II)}$  complexes are used in order to replace the use of chlorination and pasteurisation methods. The  $\text{TiO}_2$  oxidises organic matter pollution dissolved in the water. The solar reactor system is capable of producing potable drinking water from contaminated surfaces where no tap water is available. As such, it provides enormous benefits to remote locations, and its unique design also provides equipment for scientists and researchers working on water treatment.

The solar reactor design is rather simple. It consists of seven parts, among which a storage tank with vent hole and a compound parabolic concentrator (CPC) unit supporting both co-axial and fin-type solar collectors. A pump, a radiometer, water inlet and outlet system, a data-log and PVC piping, valves and a steel frame complete the structure. The unit is designed according to the specifications provided by Ecosystem Environmental Services SA in Spain, a project partner. From an engineering perspective, the units operate in a closed circulation batch mode, treating 55 l of water at one time.

The developed prototypes were built and tested to determine their effectiveness for microbial disinfection of potable water and photocatalytic degradation of a specific target compound, gallic acid. The resulting tests showed a bacterial inactivation or a reduction of *Escherichia coli* and *Enterococcus faecalis* to an order of two to three times magnitude. As such, the system's deployment in remote areas should make it a versatile and worthwhile investment, bringing safer water to the households of millions of people.

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

Collaboration sought: further research or development support; joint venture agreement; licence agreement; marketing agreement; manufacturing agreement; financial support; information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4733

## Solar resource map for Argentina

*The 'INCO 2' programme sponsored research that led to the creation of a map indicating the best regions in Argentina for applications driven by the power of the Sun.*

The aim of the Solwater project was to develop a solar-powered water purification system for use in remote regions. The successful installation of such systems requires knowledge of the amount of ultraviolet (UV) solar radiation arriving at the Earth's surface.

Scientists with the Comisión Nacional de Energía Atómica, a Solwater participant from Argentina, investigated the accuracy of direct radiation models for such applications. The model accounts for absorption of the Sun's UV radiation by ozone and air molecules as it passes through the

Earth's atmosphere. It was run using publicly available ozone column data from the total ozone mapping spectrometer (TOMS) instrument.

Output from the model was compared against data collected from the country's UV monitoring network, specifically a station in Jujuy in northern Argentina. Analysis of annual average values revealed that radiation at longer wavelengths was under-

continued on page 27

## History of earthquakes in the Dead Sea fault zone

*A combined historical, archaeological and earthquake hazard study helped to determine the level of seismic risk in the region of the Dead Sea fault zone (DSFZ). This has helped to improve the seismic catalogue, giving scientists a better understanding of each event.*

The Dead Sea fault zone presents geologists with an opportunity to study seismic processes along an active fault. The Dead Sea straddles the border between Israel and Jordan and is the lowest point on the surface of the Earth on dry land. The fault extends south to the Red Sea and north up through Lebanon and Syria ending in southern Turkey. The region also has a rich cultural heritage and possesses many ancient archaeological sites.

Scientists from the APAME project have studied seismic activity along the active fault and applied it to case studies. Researchers

can point to significant evidence for ancient earthquakes which resulted in significant damage. They produced a set of data concerning the occurrence of moderate-sized and large earthquakes with damage distribution and location for the northern segment of the fault zone.

Researchers carried out a critical evaluation of the seismic activity of the DSFZ before the present era, based on archaeological and palaeoseismological information. The work involved the assessment of the magnitude of historical events and the earthquake hazard in the study region in the DSFZ.

Researchers also carried out an assessment of the slip rate of the DSFZ.

The APAME project involved cooperation between European scientists and partners in the Middle East. The high population density and wealth of historical and cultural monuments existing within the region forms an exceptional source of information. The aim of the project was to implement seismic hazard models that can be applied to Europe. The results provide a greater understanding and insight into seismic processes along active faults and were applied to European case studies.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4919

## For selective screening of environmental pollutants

*Technological developments in the field of novel biomimetic recognition materials were achieved within the Mendos project to improve the selective recognition of priority environmental pollutants.*

During the last few decades, endocrine disrupting compounds (EDCs) mimicking the behaviour of endogenous hormones, have become suspects for various anomalies in the development, reproduction and ageing of humans and wildlife. Following the large number of chemicals with potential endocrine effects, screening methods should be capable of detecting different classes of compounds in a reasonably short time. Furthermore, they should offer the possibility to conduct on-site analysis of river water and water resources used for drinking.

The Mendos project aimed beyond current technologies that barely accommodate these requirements since they rely almost exclusively on biochemical assays. These biosensors require sophisticated preparation and handling, as well as storage capabilities that assure their long-term reliability. Almost all these drawbacks could be avoided with the introduction of biomimetic recognition materials based on molecularly imprinted polymers (MIPs)

together with highly sensitive miniaturised optical transducers.

MIPs are prepared by polymerisation of monomers in the presence of the target analyte or a similar molecule acting as a template. Subsequent removal of the template reveals sites complementary to the polymeric structure in terms of size, shape and chemical functionality and as capable of selectively rebinding template molecules. Research efforts at the Austrian Research Centers GmbH focused on coating technologies that would allow the application of MIPs as selective layers of optical sensors.

Films of MIPs with controlled thickness were deposited on the optical transducer of the biosensor by means of a standard coating technique used in the microelectronic industry. More specifically, spin coating was used to spread the monomer mixture onto the substrate and rapid curing of the films was achieved with ultra-

violet (UV) photolysis. The use of a solvent with low volatility in combination with an appropriate polymer porogen resulted in the desired porous morphology and enhanced binding capability.

These MIP films along with the optimum transduction scheme could be a versatile sensing tool for the detection of environmentally important and other analytes.

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; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4836



continued from page 26 'Solar resource map for Argentina'

estimated, while radiation at the shortest wavelength was slightly overestimated. The differences were attributed to phenomena not accounted for by the radiation model, such as the effect of aerosol absorption and scattering.

Further to the research, the Comisión Nacional de Energía Atómica plans to use correction factors derived from the analysis to estimate UV radiation across Argentina. The resulting map will facilitate site selection for solar-powered

projects, including the Solwater water purification system.

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 > 4770

## On the lysine pathway to improving animal nutrition

*The OPTI-2 project set out to improve the composition of free and protein-bound amino acids in major European crops. By regulating the amount of amino acids available in these crops, the scientists were able to improve the quality of the crop as food or feed.*

Plant breeding techniques have been used commercially for some time now with varying success. This research project entitled OPTI-2 culminated in the research team producing a commercial-type maize hybrid. What is special about this maize is that it has a higher than usual level of the amino acid lysine.

Lysine is necessary to, but not produced by monogastric animals. It therefore needs to

be provided to these animals though their diet. Corn seeds have a limited amount of lysine. The scientists found that it is possible to increase the lysine content in maize plants using bacterial or mutated plant genes, in particular the lysine insensitive deoxyhypusine synthase (DHPS) gene.

Another approach to increasing lysine content, they discovered, is to down-regulate or knock out the gene which codes for the

first enzyme that participates in lysine degradation. When lysine is present at high levels, it becomes toxic to the plant cell so the plant has evolved the means to regulate its concentration. Finally, the over-produced lysine may be stored in lysine-rich proteins.

The results of this project have had a positive influence on breeding strategies, because of their focus on improving nutritional quality. Specific consideration was given to safety aspects and consumer acceptance.

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 > 4837

## Wheat enzyme genes to reduce nitrogen pollution

*Nitrogen pollution from the overuse of artificial sources continues to be a major concern globally. Researchers in the Sustain project have successfully cloned a gene that is highly instrumental in upgrading the efficiency of nitrogen utilisation in wheat.*

The overuse of fertiliser chemicals, in particular nitrogen, to boost crop yields has come under fire for two main reasons. First, direct pollution by nitrates and second, the fertiliser is usually a fossil-fuel derived product. Moreover, nitrogen is a rate-limiting and expensive element in plant growth.

The EU has addressed these two threats to the environment by the Nitrates Directive and the common agricultural policy (CAP) reforms respectively. Progressive enforcement will almost certainly mean a drop in the price of cereal, but may also result in a decrease in crop yield with all the attendant consequences for farmers.

Scientific research funded by the EU has been promoted to help the industry to mitigate these effects. One way to address both inherent problems is to increase the nitrogen using efficiency of crops. Under the auspices of the Sustain project, partners have achieved a vital step in boosting nitrogen utilisation in wheat.

The enzyme glutamine synthetase (GS) involves pathways that increase the efficiency of nitrogen use. Accordingly, project partners at the Royal Veterinary and Agricultural University in Denmark found and classified 10 GS sequences from wheat into four sub-families. Using a combination of

genomic, mapping and inheritance studies, the scientists found that there were four distinct clades when GS genes from other monocotyledonous species were included.

The scientists then went on to clone the isolated GS genes. This was the first time these sequences had been identified and copied. The team then made them publicly available through the nucleotide sequence database, Genbank.

This research represents a possible basis for the responsible production of transgenic crops. Cloning valuable genes for mineral utilisation in a range of crops stands to benefit the health, environment and economy of Europe as well as of developing countries.

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 > 4807

## Parking done the environmentally friendly way

*The problem of finding parking in busy European towns is a reflection of the traffic problem at large. A strategy which is based on a concept of incentives encouraged a more environmentally friendly use of cars in Winchester city centre in the United Kingdom.*

Traffic congestion on the historic roads of Winchester city centre has long been a problem. Various solutions have been applied, which have had varying rates of success in alleviating the problem.

The EU-funded Miracles project applied a successful strategy which promoted an environmentally based parking policy. The scheme was based on the principle that rewarding drivers of cleaner vehicles whilst discouraging gross polluting ve-

hicles from entering the city centre, is very effective.

Prior to the implementation of the new plan, parking spaces were controlled via a pay and display system. The new system recommended that the number of long-stay spaces be reduced and the prices be increased. This represented the push element of the incentives concept used. The pull element provided incentives through graduated price discounts. The discount was based on the

carbon dioxide (CO<sub>2</sub>) emissions of the vehicle. Eligible vehicles were categorised based on the level of CO<sub>2</sub> emissions as defined by the excised duty bands as they exist in the United Kingdom. Electric or hybrid vehicles were eligible for free parking.

The results of the project showed the scheme to be a success. Ticket sales at the seven busiest city centre car parks decreased. Awareness of the project was high and more than half of those participants believed that it was a positive scheme.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4835

## Emerging computer memory technology

*Utilisation of different metal oxides for the formation of barriers in magnetic tunnel junctions has given a boost to the evolution of a new computer memory and data storage technology.*

Technological revolutions in many fronts of information technology, such as portable computing and communication devices, have created an ever-growing demand for longer data retention and higher data transfer rates. Driven by these changes in the market demand, a flurry of activity in the development of alternative memory technologies has emerged.

The NEXT project focused on a new generation of devices combining standard microelectronics with effects arising from the interaction between electrons' spin and the magnetic properties of conducting materials. The basic elements of magnetic random access memories (MRAMs) consist of magnetic tunnel junctions (MTJs) in which two ferromagnetic metallic electrodes are separated by a thin insulating layer.

The tunnelling current through these elements can be switched from a high state to a low state, an effect known as tunnelling magnetoresistance, enabling data storage. Project partners at the Instituto de Engenharia de Sistemas e Computadores — Microsistemas e Nanotecnologias in Portugal worked on the preparation of low-resistance MTJs with specific metal oxide barriers. Either physical vapour deposition (PVD) or ion beam deposition (IBD) was used to prepare aluminium oxide (AlOx) and magnesium oxide (MgO) barriers.



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Magnetic tunnel junctions with AlOx barriers showed significant magnetoresistance at room temperature. However, it was possible to increase the available magnetoresistive signal with the use of MgO barriers. Further advantages of these spin-dependent tunnel junctions included their tunable product of resistance and area (RA) with barrier thickness and degree of oxidation. Their high-density architecture made them ideal for memory applications with fast speed and low power requirements; but applications could be identified in magnetic field sensors in the very near future.

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

Collaboration sought: joint venture agreement; licence agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4779

## Meat traceability using dual electronic and DNA system

*A dual system using electronic identification (EID) and DNA auditing was set up to trace meat from farm to fork.*

Among consumers there is growing interest in the origin of the food we eat. The traceability of meat has become a sensitive issue following past food scares, such as BSE. The EU-funded 'EID + DNA tracing' project has taken a dual approach in ensuring the health and quality of life for European citizens. The project consortium set up a system based on

electronic identification and DNA profiling, which traced animals and meat.

In a total of 5 838 beef cattle and 3 708 lambs, the EID and DNA traceability system was used. In accordance with EU regulations, all animals were identified through the use of ear tags as well as through the project's EID boluses. These were developed by researchers and contained half duplex (HDX) glass encapsulated transponders. The transponders could be read by a portable reader, which was also developed by the project.

When the large pill-like boluses were administered, ear biopsies were also taken. The samples

were frozen, to be used at a later date for DNA audits. Researchers found that the animals retained the EID boluses longer than their official ear tags. Automatic transference of the animals' EIDs to the carcasses through the use of smart-tags was directly affected by the abattoir's throughput. However, after some adaptations to the reading-recording device, the throughput was found to be satisfactory.

The traceability of meat from farms until the end of the slaughtering line was found to be effective. Random audits using DNA analysis were undertaken for 5 % of samples, of which 98 % of lamb and 97.8 % of cattle were successfully traced. Traceability of carcasses from the abattoir to cut meat at the retailer was 100 %. It was concluded that the EID + DNA dual system was suitable for the EU meat industry, despite reports of operational differences and limitations between countries.

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

Collaboration sought: information exchange/training; private-public partnership; available for consultancy.

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## See what I see — machines with mental muscle

*The way we use and interact with machines is undergoing a profound change as computers are programmed to learn from experience and see more how we see. European research into machine learning is pushing back the boundaries of computer capabilities.*

Computers do not see things the way we do. Sure, they can manipulate recorded images, for example, but they currently understand very little about what is inside these pictures or videos. All the interpretation work must be done by humans, which is expensive. But one European project, named Muscle, is making computers more similar to us in their ability to interpret images and their surrounds.

Individuals from all walks of life as well as sectors such as industry, services and education, stand to reap immense benefits from semi-autonomous, more intuitive machines that are able to do things which were, until now, either not possible, too expensive or the preserve of humans. This has been made possible thanks to the developments in, and convergence of, methods for creating, obtaining and interpreting metadata — at its simplest level this is data about data, or facts about facts, in complex multimedia environments.

The EU-funded Muscle project which created a pan-European network of excellence involving more than 30 academic and research institutions from 14 countries, has come up not only with new paradigms but a range of practical applications. The scale of the project was so vast that a special section to showcase its achievements has been set up in the 3D *Second Life* internet virtual world, which has millions of denizens.

The virtual Muscle experience inside *Second Life* has been created as a one-stop information centre to ensure the continuation and sustainability of the project's achievements. Users are impersonated as avatars (computer representations of themselves) enabling them to experience multimedia

content by literally walking through it. They are able to hold real-time conversations with other members of the community, exchange experiences, or just simply browse.

After an initial two years of collaborative research across the Muscle network, a series of showcases were established with several institutions working together on each one to produce practical applications. One of these is an articulatory talking head, developed to help people who have difficulties in pronouncing words and learning vocabulary. This 'insightful' head models what is happening inside the human mouth, including where the tongue is positioned to make particular sounds, so the users can copy what they see on screen.

A second showcase functions as a support system for complex assembly tasks, employing a user-friendly multimodal interface. By augmenting the written assembly instructions with audio and visual prompts much more in line with how humans communicate, the system allows users to easily assemble complex devices without having to continually refer to a written instruction manual.

In another showcase, researchers have developed multimodal audiovisual, automatic speech recognition software which takes its cues from human speech patterns and facial structures to provide more reliable results than using audio or visual techniques in isolation.

Similarly, a showcase which has already attracted a lot of publicity especially in the United States, is one that analyses human emotion using both audio and visual clues.

'It was trialled on US [United States] election candidates to see if their emotional states actually matched what they were saying and doing, and it was even tried out, visually only of course, on the enigmatic Mona Lisa,' says Muscle project coordinator Nozha Boujemaa.

Giving computers a better idea of what they are seeing or what the inputs mean, another showcase developed a web-based, real-time object categorisation system able to perform searches based on image recognition — photos including horses, say, or strawberries. It can also automatically categorise and index images based on the objects they contain.

In an application with anti-piracy potential, one showcase came up with copy detection software. 'This is an intelligent video method of detecting and preventing piracy. There is a lot of controversy at the moment about copyright film clips being posted on *YouTube* and other websites. This software is able to detect copies by spotting any variation from original recordings,' Boujemaa explains.

'Another application is for broadcasters to be able to detect if video from their archives is being used without royalties been paid or acknowledgement of the source being made. Europe's largest video archive, the French national audiovisual archive, has now been able to ascertain that broadcasters are only declaring 70 % of the material they are using,' she tells ICT Results.

Other types of recognition software, effectively helping computers see what we see, can remotely monitor, detect and raise the alarm in a variety of scenarios from forest fires to old or sick people living alone falling over. The latter falls under the heading of 'unusual behaviour', which also has applications in video security monitoring with 'intelligent' cameras able to alert people in real time if they think somebody is suspicious.

'During the course of the project, we produced more than 600 papers for the scientific community, as well as having two books published, one on audiovisual learning techniques for multimedia and the other on the importance of using multimedia rather than just monomedia,' she says.

Although the massive project has now wound down, its legacy remains online, in print and most of all in a host of new applications that will affect the lives of people all over the world.



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## NEXT generation of random access memory

*Ever since the beginning of electronic data processing, new discoveries made in the field of magnetism have been driving spectacular advances in the performance of data storage systems. The first integration of magnetic tunnel junctions (MTJs) with standard complementary metal oxide semiconductor (CMOS) technology was achieved as part of the NEXT project to take these advances further.*

When running a software program, the fast random access memory (RAM) keeps the application accessible and allows users to read from memory, as well as write new data to memory. However, most semiconductor-based RAM is volatile, meaning that it requires constant power supply to operate. If electric power is disrupted, data being held

in RAM is lost. On the other hand, MTJs are intrinsically immunised against power supply disturbances.

When current is applied perpendicularly to the two layers of ferromagnetic material comprising MTJs, it crosses the insulating barrier between them by a purely quantum effect, the tunnel effect. The relative magnetic field alignment of the separated magnetic materials induces a current path of either high or low resistance. This resistance difference is identified as a stored bit of information which can be preserved when the power supply is disrupted.

The integration of CMOS with magnetic memory elements attracted the interest of the NEXT project partners because this new approach offers many advantages. The compact structure of MTJs, but more importantly their high magnetoresistance that is compatible with high-speed sensing using CMOS circuitry, may lead to the consideration of several

RAM architecture possibilities. Researchers at the Commissariat à l'énergie atomique in France succeeded in overcoming a major stumbling block for their integration based on standard 0.35  $\mu\text{m}$  CMOS technology.

The limiting availability of processing equipment suitable for CMOS integration led them to the development of an integration route based on ion beam etching (IBE). This simple vacuum-compatible technique offered significant advantages for patterning submicron-sized MTJs on silicon substrates up to 200 mm in diameter. It was proven to be sufficiently advanced to support accurate etching of a high-resolution pattern, but not mature enough to offer the uniformity required for magnetic data storage.

As the first components for magnetic random access memory (MRAM) were just being developed, alternative writing strategies had already been proposed and attracted the attention of investors. The start-up company Crocus Technology was created, which will make available samples of their first prototypes.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4841



## Information resources for disabled senior citizens

*A bibliographic database and literature review containing references, materials and good practice methods for disabled senior citizens with Parkinson's disease as well as other diseases has been created.*

The actual health and social care needs of elderly people with disabilities are often not met because they are difficult to match with the different perceived notions professionals may have. With better understanding of a disabling illness, a patient's quality of life can be significantly improved.

Through empirical research covering the personal views and experiences of 500 elderly people and their care takers, the Infopark project sought more appropriate standards of support through recommendations and educational materials. Included in the study were patients with varying physical, mental and social disabilities as well as different social, cultural and economic backgrounds. Their personal views and experiences were compared with perceptions of 700 professionals across seven European countries.

Included in this was the development of an index of information sources, materials and

good practice along with a bibliographic database containing material for Parkinson's disease in particular. A literature review, which comprised the information needs of elderly disabled individuals with Parkinson's disease, was also compiled as was a generic literature review covering other diseases including cancer.

It became evident that additional information is very beneficial to chronically ill patients since it offers a better understanding of symptoms, causes, prognosis and available management options and services. It is important that this information be writ-

ten in non-technical language and style and that it is supported with recommendations for further reading. Furthermore, a major source of information for care givers and elderly patients is available via electronic media. As a result of these efforts, the elderly can be empowered by taking a more active role in their health care.

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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## Technology behind the personal network

*Experts believe personal networks (PNs) will run to a thousand devices by 2017, which presents an enormous networking challenge. European researchers are developing some very clever technology to create a smart PN that can cope with all these devices.*

When sensors, personal and home devices and in-car technology are all counted, the expert group, the Wireless World Research Forum, believes people will own and use up to a thousand devices by 2017. It may not be that many in the end, but it will be an awful lot and it will be impossible for an individual to manage all the data, networking, functionality and services for so many tools. Smart PNs will be essential.

A PN links together a group of personal area networks (PANs) and all devices and technology belonging to a private entity, whether it is a person, or eventually a car or an airplane. Developing a robust, effective and trustworthy network represents an enormous challenge.

Enter the 'Magnet beyond' project, a huge European effort to develop a PN to respond to the challenge posed by 2017. The vision requires a lot of new software and hardware technology, and key to the technical effort was the development of the architecture, optimised air interfaces and tailored security.

The architecture in 'Magnet beyond' is based on four conceptual layers: connectivity, network, service enabler (middleware), and service layers.

The connectivity layer is able to handle connections to any mix of radio frequency (RF) networks, from Bluetooth to 3G and everything in between. It is also designed to cope with any emerging RF technologies, like beyond 3G (B3G). The connectivity layer masks the underlying RF system from the rest of the Magnet platform, which provides seamless and hassle-free connections for the user.

The network layer handles the management or creation of PNs and communications within and between PNs. It is also responsible for the creation of permanent or temporary PN federations. A federation exists when two separate PNs link together — to those belonging to friends, family, clients or colleagues, for example.

The federation can exist on a temporary or permanent basis. Similarly, when the user is travelling, the PN can federate with anyone he or she meets. It is known as a promiscuous PN.

The middleware layer provides overlays for service and context management and acts as a service enabler.

'Magnet beyond' went beyond software and developed innovative new hardware prototypes for the support of the Magnet system. The project designed two new optimised air interfaces for low data rate (LDR AI) and for high data rate (HDR AI) communications.

The LDR AI is based on ultra-wideband (UWB) transmission with frequency modulation (FM) aiming at short-range applications with low data rates. Transmission is under 10 m and lower than 100 kbps. The interface is power efficient, cost efficient and simple to manufacture and integrate into common devices.

'The project has produced one of the first, if not the first, UWB chipset for high-band operation,' explains Liljana Gavrilovska, Technical Manager of the 'Magnet beyond' project. UWB is a radio technology that can work with very low energy levels for short-range high-bandwidth communications by using a large portion of the radio spectrum collectively.

The HDR AI, on the other hand, relies on multicarrier transmission with frequency spectrum spreading (MC-SS) to maximise achievable data rates, which are impressive: the maximum data rate is approximately 130 Mbps. The two radio interfaces can coexist on the same device providing multimode operations.

The HDR achieves its data rate without using multiple-input multiple-output techniques (MIMO), which could push the rate higher. It means the technology has an upgrade path that can cope with higher data rate applications of the future.

The air interfaces are an impressive success, offering a new standard in optimised, low-cost communications. Even better, other EU-funded projects are keen to take advantage of the new devices. Both the Oracle and WHERE projects are exploring the potential of the HDR AI, and OMEGA has also shown an interest. Right now, the 'Magnet beyond' HDR is in the patent process. And that was just one element of the overall Magnet programme.

Security, too, was a major focus of the project and led to a suite of solutions. There were four core activities, with security working across all layers.

The first activity, PN security architecture, looked at network security and group communication. Another activity, lightweight crypto, examined improvements for pairing devices within a PN, establishing a link between two devices.

A third, context-aware security management, dealt with privacy, profiles, roles and associated security requirements relevant to the user's context, whether at work or home, for example. Finally, the project undertook validation, implementation, performance and analysis of potential threats and attacks.

The methods developed by the group included a PN federation protocol suite, secured through separate lightweight public key infrastructure for authentication. It also uses a high-performance group key management for access control.

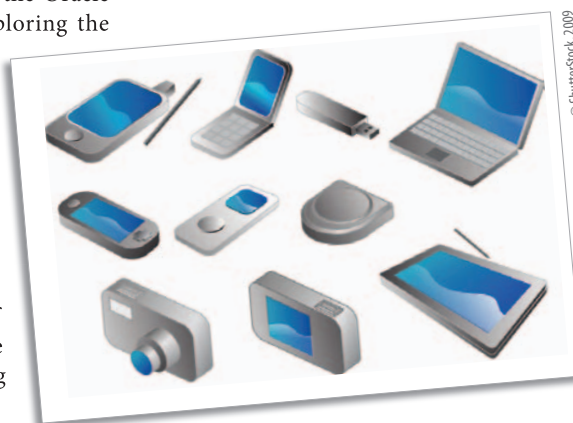
The EU-funded 'Magnet beyond' project also developed a new physical layer encryption concept that works with very low-power devices. Anonymity, too, was a focus of the security efforts, with the project developing an avatar concept to provide a virtual identity and ensure complete, anonymous access.

In all, the hard and soft technology developed by 'Magnet beyond' responded to real, current needs, but designed solutions so that they are flexible and upgradable, and can adapt to new standards and technology in the future.

It is an impressive list of achievements and finally delivers a platform that can create simple, transparent, effective and secure smart PNs capable of coping with the bewildering growth in personal technologies. But the real proof of 'Magnet beyond' technology lies in the real-world performance tests undertaken with the prototype in validations and pilot demonstrations.

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## Computer-assisted dosage study

*The incidence of thromboembolic disorders can be improved with oral anticoagulation treatment, yet administering this treatment can be problematic. This project assessed the possibility of using computer-assisted dosage treatment as a cost-effective and clinically beneficial alternative to traditional manual dosage given by medical professionals.*

The primary objective of this project was to assess the clinical benefit of providing a computer-assisted dosage of oral anticoagulation treatment. The project entitled 'EAA computer-dosage' was the largest ever study of this kind to establish the reliability of computer-assisted dosage compared to traditional manual dosage by experienced professionals.

Although it had been established that such a venture would be cost-effective, it was first necessary to establish if this method of treatment was effective in preventing bleeding and thrombotic complications during the treatment. The results of the study revealed that the computer-assisted dosage is at least as safe

and reliable clinically as the dosage method carried out by experienced medical staff.

The results were presented to the medical profession across the EU and worldwide in reports to general and specialist medical journals and at national and international scientific meetings. It was established that this method would be both cost-effective and of great advantage to the clinical and national administrative authorities responsible for patient care. The project also provides the basis for the establishment of a vast interlinked network of computer-dosage systems across the EU — regional, national and international with the possibility of wider linkage via internet.



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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; joint venture agreement.

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## Software program for polymorphism detection

*Scientists have developed a bioinformatics tool that will enhance their ability to detect single nucleotide polymorphisms (SNPs) in offspring.*

Researchers from the GRASP project used the C++ programming language to develop the PolyM software tool. This software combines all the necessary steps for selecting polymorphisms in genes. The program uses an input file which comprises an alignment of the gene sequence from a set of genotypes. The software then identifies the different alleles and their frequency in a set of genotypes, generating a minimum set of polymorphisms. These are then used to differentiate all the alleles generated.

The polymorphisms for allele differentiation are then selected according to their

polymorphic information content (PIC) value. The PolyM program calculates the polymorphisms required for differentiating the genotypes in the offspring. This is based on the entire dataset or upon parental genotypes/alleles chosen by the user. A table then supplies all the possible genotypes for the offspring and the expected marker for the phenotype. This information can be used to study SNP detection results in the offspring.

The software is mainly applicable to plant breeding where it can help in marker-assisted selection. The amount of informa-

tion regarding allelic variation for genes controlling agronomic traits has continued to grow. Therefore, it has become increasingly important to be able to find the most relevant polymorphisms and identify those alleles which are valuable for developing breeding populations. The software reduces the amount of work and costs required for these activities, thereby contributing to the competitiveness of European plant breeders and researchers.

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.

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## Rice functional genomics website

*A website was developed to feature work undertaken for functional genomics analysis of rice (Oryza sativa). It acts as a public platform and allows researchers from around the world to look for mutants and the gene structure of any rice gene.*

The nutrition of human beings is based on cereals, which form the staple food for 90 % of the world's population. Improved nutritional quality and resistance to disease and environmental stress in cereals will help to ensure a stable food supply in the future.

Scientists commonly use rice as a genetic model due to it having the smallest cereal genome. Other benefits to studying rice

include detailed molecular maps and ease of transformation. Researchers from the 'Cerealgene tags' project developed and used functional genomics and proteomics for rice whose genome had been sequenced.

The project team created the website *OryGenesDB* to showcase sequence information resulting from their activities. This included data on transposon insertion flanking sequence tags (FSTs). This infor-

mation was displayed for analysis and use and linked to related molecular data from external rice molecular resources.

Researchers used this database of all publicly available rice insertion mutants to show the frequency of obtaining insertions in genes. This was higher for the Ac-Ds population produced by the 'Cerealgene tags' project than for the T-DNA or Tos17 insertions produced by other research teams.

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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## Robotic ants building homes on Mars?

*Recent discoveries of water and Earth-like soil on Mars have set imaginations running wild that human beings may one day colonise the red planet. However, the first inhabitants might not be human in form at all, but rather swarms of tiny robots.*

'Small robots that are able to work together could explore the planet. We now know there is water and dust so all they would need is some sort of glue to start building structures, such as homes for human scientists,' says Marc Szymanski, a robotics researcher at the University of Karlsruhe in Germany.

Szymanski is part of a team of European researchers developing tiny autonomous robots that can cooperate to perform different tasks, much like termites, ants or bees forage collaboratively for food, build nests and work together for the greater good of the colony.

Working in the EU-funded I-SWARM project, the team created a 100-strong posse of centimetre-scale robots and made considerable progress toward building swarms of ant-sized micro-bots. Several of the researchers have since gone on to work on creating swarms of robots that are able to reconfigure themselves and assemble autonomously into larger robots in order to perform different tasks. Their work is being continued in the Symbion and Replicator projects that are funded under the Seventh Framework Programme (FP7).

Planet exploration and colonisation are just some of a seemingly endless range of potential applications for robots that can work together, adjusting their duties depending on the obstacles they face, changes in their environment and the swarm's needs.

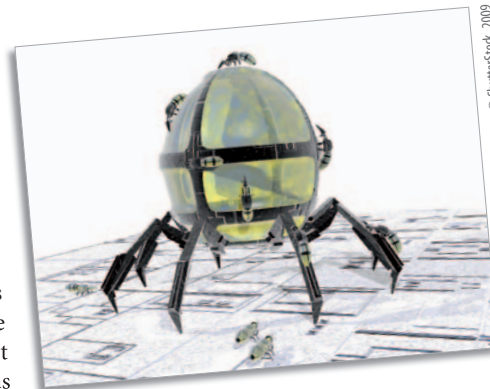
'Robot swarms are particularly useful in situations where you need high redundancy. If one robot malfunctions or is damaged it does not cause the mission to fail because another robot simply steps in to fill its place,' explains Szymanski.

This is not only useful in space or in deep-water environments, but also while carrying out repairs inside machinery, cleaning up pollution or even carrying out tests and applying treatments inside the human body — just some of the potential applications envisioned for miniature robotics technology.

Putting swarming robots to use in a real-world environment is still, like the vision of colonising Mars, some way off. Nonetheless, the I-SWARM team did forge ahead in building robots that come close to resembling a programmable ant.

Just as ants may observe what other ants nearby are doing, follow a specific individual, or leave behind a chemical trail in order to transmit information to the colony, the I-SWARM team's robots are able to communicate with each other and sense their environment. The result is a kind of collective perception.

The robots use infrared to communicate, with each signalling another close by until the entire swarm is informed. When one



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encounters an obstacle, for example, it would signal others to encircle it and help move it out of the way.

A group of robots that the project team called Jasmine, which are a little bigger than a two-euro coin, use wheels to move around, while the smallest I-SWARM robots, measuring just three millimetres in length, move by vibration. The I-SWARM robots draw power from a tiny solar cell, and the Jasmine machines have a battery.

'Power is a big issue. The more complex the task, the more energy is required. A robot that needs to lift something [uses] powerful motors and these need lots of energy,' the researcher notes, pointing to one of several challenges the team have encountered.

Processing power is another issue. The project had to develop special algorithms to control the millimetre-scale robots, taking into account the limited capabilities of the tiny machine's onboard processor: just eight kilobytes of program memory and two kilobytes of RAM, around a million times less than most PCs.

Tests proved that the diminutive robots were able to interact, though the project partners were unable to meet their goal of producing a thousand of them in what would have constituted the largest swarm of the smallest autonomous robots ever created anywhere in the world.

Nonetheless, Szymanski is confident that the team is close to being able to mass produce the tiny robots, which can be made much like computer chips out of flexible printed circuit boards and then folded into shape. 'They're kind of like miniature origami,' he says.

Simple, mass production would ensure that the robots are relatively cheap to manufacture. Researchers would therefore not have to worry if one gets lost in the Martian soil.

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## Attempting to measure electron charge accurately

*The electronics industry wonders what will happen when transistors become so small that quantum effects become important. Meanwhile the Squbit-2 project partners have built a novel transistor that actively exploits the quantum properties of electrons.*

The single electron tunnelling (SET) transistor has been devised by researchers seeking to find out whether the quantum nature of electrons will determine how devices are built. Single electron tunnelling transistors consist of a small metallic island connected to two separate electrodes by tunnel junctions for the entrance and exit of electrons. By applying voltage on a gate electrode capacitively coupled to the island, the energy needed to charge electrons on the island is controlled.

The SET transistors' sensitivity to charge makes them ideal for high-precision electrometers that could measure the delicate superpositions of charge states in super-

conducting islands. On the other hand, superconducting islands could provide a means for implementing the quantum bits needed for quantum computers. Therefore the focus of research efforts undertaken by the Squbit-2 project partners was focused on eliminating the undesirable measurement noise.

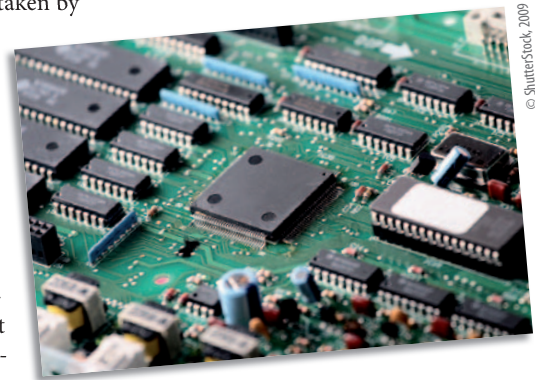
More specifically, a radical approach to eliminating noise coming from the substrate was explored at the laboratories of the University of Jyväskylä in Finland. Aluminium single electron transistors were fabricated with the island out of contact with the silicon nitride (SiN<sub>2</sub>) sub-

strate. Careful investigations have demonstrated that noise caused by trapped charge fluctuators in the substrate was minimised. The way has therefore been opened for the application of these devices in solid state systems suitable for quantum computation.

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

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

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## Tele-rehabilitation brings therapy to new levels

*Physiotherapy and ergotherapy have been integrated into tele-rehabilitation care for patients with spinal cord injuries.*

The level of care for spinal cord injury patients receiving therapy has improved thanks to the Thrive project which has brought specialised rehabilitation facilities closer to the patient's home. This permits patients to be closer to their loved ones and in their private surroundings while at the same time obtaining quality treatment. Furthermore, earlier discharge may be possible as well as follow-up care which collaborates closely with centres, caregivers, patients and homecare staff.

This approach was evaluated in Belgium, Italy and the United Kingdom in private

as well as public health care systems. The impact of tele-rehabilitation was measured in terms of the quality of care and the patient's quality of life and satisfaction as well as the cost. Various protocols for tele-rehabilitation were pinpointed, validated and submitted for accreditation.

In particular, a protocol for physiotherapy and ergotherapy was validated and adapted. Both fields play an important role in the care of spinal cord injured patients. They aid in the prevention of complications and chronic disease and help to restore daily life activities in patients with impaired mobility.

Therapies pay special attention to patient mobility with the use of wheelchairs, prostheses and domestic home equipment.

The tele-rehabilitation protocol designed by the Thrive project has integrated all aspects of physiotherapy and ergotherapy. In so doing, patients can continue to be monitored even after their discharge from a spinal cord facility. Used in conjunction with medical and nursing protocols, it provides new horizons for patients with spinal cord injury.

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

Collaboration sought: information exchange/training.

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## Visualising enhanced coastal management

*A web-based geographical information system (GIS) tool serving as an interface for the visualisation of datasets and an integrative tool for spatial analysis and thematic maps has been developed. This tool lends support for the management of coastal areas, particularly five coastal lagoons in southern Europe.*

The DITTY project developed scientific and operational means for the sustained and rational use of resources concerning southern Europe's lagoons. In so doing, related effects from agriculture as well as urban and economic activities which impact aquaculture were taken into consideration. As a result, information technology tools specifically designed for such ecosystems were created.

During the course of the project came the development of the GIS tool which allows all partners accessibility via the Web, opening the channels of communication between developers and end-users. The tool can also link previously compiled information with later information.

The WebGIS tool is accessible via the project's main webpage with the use of

a simple web browser. Some of the tool's functions are its ability to visualise a map of a selected test site and selected outputs of the simulation models created for each test site. It can provide support to local authorities involved in coastal management and heighten the public's role in the implementation process.

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

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

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## Download, install and drive — the future of automotive software

*Computers, mobile phones and other electronic devices regularly download software updates to keep obsolescence at bay. That's not the norm for cars. But that could change thanks to an automotive software architecture developed by European researchers to keep vehicles up to date with the latest technology.*

Developed over two and a half years by a consortium of research institutes, software companies, vehicle manufacturers and parts suppliers, the architecture represents a fundamental building block for an intelligent car able to reconfigure and update itself autonomously, as well as communicate with other devices, such as the driver's mobile phone or PDA.

'The architecture is the basis for a kind of adaptable onboard operating system... but one that's much more robust than what is on your PC,' says Martin Sanfridson, a researcher at Volvo Technology in Sweden and the coordinator of the EU-funded DySCAS project in which the architecture was developed.

By using middleware solutions — software that allows different systems to interoperate — the DySCAS architecture could allow the car's onboard navigation system to automatically access addresses on the driver's PDA to save them from having to be input manually, or it could play music directly from their mobile phone. More importantly, it would make installing new features and components or changing existing ones considerably easier.

'Cars take many years to develop and most are designed to be on the road for perhaps a decade. In that time, technology can change a lot, but currently there is no efficient way to update the software in these vehicles,' explains Sanfridson.

An obvious example of the technological lag is onboard entertainment. Car companies were still putting cassette players in vehicles 10 years ago, even though they had been superseded by CDs and they are still putting CD players in cars today as MP3 players overtake the market. In a rapidly changing and increasingly networked environment, in-car entertainment systems will probably need to be frequently updated in the future in order to keep up with new formats.

Much as the software on a PC connects to the internet to download and install updates, the DySCAS architecture allows automotive software to automatically download patches and improvements whenever the vehicle is in range of an accessible wireless hotspot — in the owner's garage, for example, or even in a public parking lot. It could then download new maps for the navigation system, update the entertainment system to play new music formats, or even adjust engine timing based on more fuel efficient settings supplied by the manufacturer.

Sanfridson sees the architecture first being used to update non-critical systems, such as navigation aids and communication and entertainment platforms, though once it proves reliable enough, it could be used to automatically update and adjust critical components and settings.

The researchers also explored the possibility of using the architecture to improve fault tolerance, so that if one electronic control unit (ECU) fails another could automatically step in and perform its function. With increasing numbers of electronic components in cars, controlling everything from security alarms and central locking to automatic braking (ABS) and engine timing, having backup systems and effective load balancing is one



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way of improving reliability. And ensuring reliability, particularly when a failure could affect safety, is perhaps the biggest challenge for any new automotive technology.

For that reason carmakers and parts manufacturers first concentrated on developing a static, standardised architecture to ensure interoperability between different onboard components and systems in the belief that a static system would be more reliable than a flexible one. Known as Autosar, the architecture is a standard infrastructure on which to run automotive software that is installed before the car rolls off the factory floor and generally cannot be modified afterwards.

It is only now starting to make its way into new models of vehicles. The DySCAS system, as a flexible and adaptable architecture, but one that has yet to be proven reliable, will therefore probably not make its way into commercial vehicles for several years.

'We have spent a lot of time discussing how to apply our architecture with Autosar. Initially it will probably be installed separately to update non-critical systems but further down the road it could be integrated into it,' Sanfridson says.

Volvo Technology and Daimler, the other automaker involved in the project, are both planning to continue developing the DySCAS architecture, and may start implementing some elements of the technology into their vehicles. Sanfridson also notes that Volvo Cars, formerly part of the Swedish Volvo Group and now a unit of Ford, has also expressed interest in the technology, while Volvo Group is studying how it could be used in its trucks and heavy vehicles.

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## Breakthrough for post-4G communications

*With much of the mobile world yet to migrate to 3G mobile communications, let alone 4G, European researchers are already working on a new technology able to deliver data wirelessly up to 12.5 Gb/s.*

The technology known as 'millimetre (mm)-wave' or microwave photonics has commercial applications not just in telecommunications (access and in-house networks) but also in instrumentation, radar, security, radio astronomy and other fields.

Despite the quantum leap in performance made possible by combining the latest radio and optics technologies to produce mm-wave components, it will probably only be a few years before there are real benefits for the average EU citizen.

This is thanks to research and development work being done by the EU-funded project Iphobac, which brings together partners from both academia and industry with the aim of developing a new class of components and systems for mm-wave applications.

The mm-wave band is the extremely high frequency part of the radio spectrum, from 30 to 300 gigahertz (GHz), and it gets its name from having a wavelength of one to 10 mm. Until now, the band has been largely undeveloped, so the new technology makes more of the scarce and much-in-demand spectrum available for exploitation.

Iphobac is not simply a 'paper project' where the technology is researched, but very much a practical exercise to develop and commercialise a new class of products with a 'Made in Europe' label on them.

While several companies in Japan and the United States have been working on merging optical and radio frequency technologies, Iphobac is the world's first fully integrated effort in the field, with a lot of different companies involved. This has resulted in the three-year project, which runs until end-2009, already having an impressive list of achievements to its name.



It recently unveiled a tiny component, a transmitter able to transmit a continuous signal not only through the entire mm-wave band but beyond. Its full range is 30 to 325 GHz and even higher frequency operation is now under investigation. The first component worldwide able to deliver that range of performance, it will be used in both communications and radar systems. Other components developed by the project include 110 GHz modulators, 110 GHz photodetectors, 300 GHz dual-mode lasers, 60 GHz mode-locked lasers, and 60 GHz transceivers.

Project coordinator Andreas Stöhr says mm-wave photonics is a truly disruptive technology for high-frequency applications. 'It offers unique capabilities such as ultra-wide tunability and low-phase noise which are not possible with competing technologies, such as electronics,' he says.

What this will mean in practical terms is not only ultra-fast wireless data transfer over telecommunications networks, but also a whole range of new applications (<http://www.iphobac-survey.org>).

One of these, a 60 GHz photonic wireless system, was demonstrated at the 'ICT 2008' exhibition in Lyons, France, and was voted into the top 10 best exhibits. The system allows wireless connectivity in full high definition (HD) between devices in the home, such as a set-top box, TV, PC, and mobile devices. It is the first home area network to demonstrate the speeds necessary for full wireless HD of up to 3 Gb/s.

The system can also be used to provide multi-camera coverage of live events in HD. 'There is no time to compress the signal as the director needs to see live feed from every camera to decide which picture to use, and ours is the only technology which can deliver fast enough data rates to transmit uncompressed HD video/audio signals,' says Stöhr.

The same technology has been demonstrated for access telecom networks and has delivered world record data rates of up to 12.5 Gb/s



over short- to medium-range wireless spans, or 1 500 times the speed of upcoming 4G mobile networks.

One way in which the technology can be deployed in the relatively short term, according to Stöhr, is wirelessly supporting very fast broadband to remote areas. 'You can have your fibre in the ground delivering 10 Gb/s but we can deliver this by air to remote areas where there is no fibre or to bridge gaps in fibre networks,' he says.

The project is also developing systems for space applications, working with the European Space Agency (ESA). Stöhr said he could not reveal details as this has not yet been made public, save to say the systems will operate in the 100 GHz band and are needed immediately.

There are various ongoing cooperation projects with industry to commercialise the components and systems, and some components are already at a pre-commercial stage and are being sold in limited numbers. There are also ongoing talks with some of the biggest names in telecommunications, including Siemens, Ericsson, Thales Communications and Malaysia Telecom.

'In just a few years time everybody will be able to see the results of the Iphobac project in telecommunications, in the home, in radio astronomy and in space. It is a completely new technology which will be used in many applications even medical ones where mm-wave devices to detect skin cancer are under investigation,' says Stöhr.

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## It's like software understands, um, language

*EU researchers have taken speech recognition to a whole new level by creating software that can understand spontaneous language. It will, like, make human-machine interaction, um, work a lot more, er, smoothly.*

Automated speech recognition has revolutionised customer relations for banks, allowing them to respond quickly and with less staff to more low-level queries. It has helped to enable online banking and the development of more advanced private and public services because machines can handle routine matters, leaving people to take care of more serious issues.

But this technology has its limits. The most common, very basic voice system asks a series of questions or offers a series of options, slowly and fitfully narrowing down your problem or supplying the solution. It would be nice to just tell the service what you want.

Soon, you can, thanks to the work of the Luna project, a European-wide effort to dra-

matistically advance the power and intelligence of speech recognition. The team is moving the system from utterances — like 'yes', 'no' or 'account' — to spontaneous speech, such as 'I want to get the balance on my current account.'

This high level of speech recognition is called spoken language understanding (SLU), where software understands the meaning of what you are saying and can filter out the irrelevant verbiage, like 'um', 'ah' and 'er'.

Luna's work in several languages is even more impressive. It has developed the most advanced SLU for both Polish and Italian, languages that had no similar systems before.

It is a big job. 'We had to spend a lot of time initially recording spontaneous conversations between people and between people and machines,' explains Silvia Mosso, coordinator of the EU-funded Luna. This is called the corpora, the collection of words and phrases that gives the software its basic language.

Then, researchers have to annotate the terms in a way that machines can understand, and finally they apply statistical language models. 'You can say things like "I have a problem with my printer" and it will help you go through the options,' says Mosso.

The result is a system that can interact with people in a much more natural and fluid way. It will mean faster and more productive

interactions with service centres, whether it is getting travel information from public transport, dealing with an IT problem or tourist information — three of the areas where Luna applied its research.

'The advantage with these areas is that you can apply our work to any kind of help centre. But if you want to apply it to different areas, then you need to do the initial collection of the conversations, the corpora, again,' Mosso reveals.

Their scientific work is perhaps even more important. It looked at the fundamental mechanics of language and the development of SLU, work that will have potential applications in robotics and other areas.

Luna presented its work at 'ICT 2008', Europe's largest conference and exhibition for European information and communication technology (ICT) research, and its demonstration was well received. 'We had an avatar presenting the project and talking to people about it, and it was very popular.'

The work of the project is guaranteed practical use, with industrial partners like France Telecom, Loquendo and CSI Piemonte planning to incorporate the results into the services run within public administrations.

And the project has still several months left before it ends. 'We have released the baseline systems in three languages and we will be refining them over the last months of the project.' And then people can look forward to telephone systems with a little more understanding.

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## Online meeting place for human biomonitoring researchers

*A dynamic human biomonitoring (HBM) knowledge base that aims to serve academics, policy-makers as well as members of industry has been published online.*

Europe is looking to integrate its health and environmental policies in a more coherent fashion. HBM is to play a key role in this effort. The ESBIO project contributed to this aim by putting the necessary infrastructure in place to promote the exchange of expertise and experience in HBM.

Working with funding from FP6, the Lisbon Faculty of Medicine in Portugal, an ESBIO participant, constructed an online inventory of HBM research. Detailed information for projects new and old, dating back

up to 10 years, was collected, organised and made available. In addition, HBM activities not directly related to research were also included.

A search mechanism was developed to allow users of the online inventory to obtain results prioritised according to the research subject, personnel, methodologies, etc. In addition, an electronic message board facilitates communication between the full range of stakeholders. New visitors are encouraged to submit information for unlisted research.

In order to attract as many potential users as possible, the Lisbon Faculty of Medicine and its ESBIO partners intend to incorporate several new features in the future. For example, the online inventory will be extended to include sections dealing with specific aspects of HBM research as well as discussion forums. Finally, special events are also being planned to further increase awareness of the inventory in the research community.

Funded under the FP6 cross-cutting activity  
'Research for policy support'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4750

## Teaching intangibles with technology

*Teach students some facts, and they learn for one exam at a time. Teach students to think, and they learn how to learn for the rest of their lives. Ambitious work from European and Israeli researchers is making it easier to help students learn to think for themselves. This is exciting stuff for teachers.*

A new system developed by European researchers will help students to learn critical thinking, social interaction, discourse, rhetoric and self-expression. Better yet, they won't even know they are learning. And one final bonus, the process will help them internalise hard information relevant to the school curriculum.

It sounds unlikely, but the benefits of classroom discussion have long been known. It allows students to demonstrate learning in a real situation, thereby making the information more concrete.

Until now, it has been very difficult for classroom instructors to keep track of who is contributing, how much they are putting in, and how frequently. Often the interaction is reduced to forced responses from prompting by the teacher. This can be overcome by breaking the class into small groups, but then the teacher cannot provide the supervision, encouragement and direction needed to ensure discussion stays on topic and productive.

Step forward technology enhanced learning, specifically a suite of online discussion tools intended for use in school labs, initially. Now it is possible to break the class into small groups, have them discuss topics via computers and, with the recent work of the Argonaut project, give teachers powerful tools to keep track of who is saying what, using what kind of statements and with what degree of sophistication.

'The problem up to now is that classroom discussion couldn't scale. It works fine in one or two small groups, closely supervised by a teacher, but once you spread that out to

30 students in 6 to 10 groups, the unaided teacher easily loses track and control,' explains Raul Drachman, coordinator of the EU-funded Argonaut project.

Argonaut set out to build on discussion software that was very good at mapping conversations, and added to that a moderator's interface with two important levels of operation. On one level, Argonaut sought to provide — in an easily grasped graphic — quantitative data to teachers, such as who is talking a lot or not at all, and who has not contributed in the last 15 minutes. This is called the shallow loop.

On another, far more sophisticated level, the researchers sought to use artificial intelligence to provide qualitative data, such as the types of statements students were making and their potential value for the discussion and the underlying learning process. This is called the deep loop.

The deep loop is a learning program that builds on records of previous discussions, with various exchanges annotated by teachers. The annotations highlight types of comments that are relevant or irrelevant, and different types of arguments.

Over time, the machine learns offline but then can apply alerts, autonomously, during a real discussion. The system can also learn classic patterns of interaction that occur in certain discussions and can then spot them in a live setting.

These powerful aids are allied to a series of useful functions that help teachers do their supervising job better. Awareness and situation alerts can inform the teacher when students start to wander off topic, talking perhaps about an upcoming party.

They can alert the teacher when one student is not contributing, or is being ignored, or is dominating the conversation. It also renders exchanges in a graphic manner, readily describing the ongoing discussion at a

glance. And teachers can program the software to signal when certain keywords occur, such as when Napoleon appears in a conversation about the French Revolution.

The system can even tell teachers that one discussion contains only questions or comments, but no arguments. The teacher can then suggest to the group that it enlarges upon comments or statements that have been made. Along with the positive criticism, students absorb the essentials of rhetoric and critical thinking.

The discussion software is highly regarded and long established, with the first version appearing in 2004 after the work of the DUNES project and the CoolModes/Free-Style project. The discussion visualisation software is enormously popular among thousands of schools in dozens of countries across the globe, and Argonaut has enhanced the system with powerful moderator's tools, making it a complete package and allowing it to scale up.

So far, dozens of teachers who have tested these new moderators' tools are very excited by the developments and are eager to deploy them throughout the school. That should not be too difficult, because Argonaut is leaving the system as open source.

However, commercial opportunities for the software also exist. 'If a company asks us to develop a specific, tailored package for them, then we can make that proprietary,' notes Drachman. Rather like Red Hat Linux is a commercial version of the open source software.

And Drachman believes there will be many commercial opportunities to provide training, installation and set up of an Argonaut system in schools across the globe.

But that, really, is just the beginning. Drachman sees the Argonaut kit as an ideal collaborative tool for project management and planning. Executives can be sure they keep meetings on target and moving forward, ensuring that every voice is heard and every idea considered.

As Drachman concludes: 'There are many, many potential applications for this software. Teaching is just the beginning.'

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90352>



## Web cubed — the network of everything

*Handsets, laptops, cars and even clothes: they are all part of the 'network of things', an incarnation of the future internet, and European researchers are working hard to create that future now.*

The future internet promises to be a lot bigger than Web 2.0. Call it Web cubed, if you will, but it promises to usher in pervasive networks that link electronics, clothing, cars and pretty much everything in between. The upshot will be a network that can accompany and support users in any situation, dynamically adapting not only to the location, but also the contexts like work and leisure.

But there are some big problems facing this rosy future. 'The first problem is scale. A network capable of linking everything together will be huge, and it will take some serious engineering to create a framework and platform capable of attaining this sort of scope,' explains Daniele Miorandi of Create-Net, coordinator of the Bionets project.

The future internet will link billions of devices, or at least must be capable of doing so. It makes the most powerful network paradigms of today appear puny.

And that is just the beginning of the challenges. Miorandi cites a series of obstacles of a similar magnitude that stands between the engineers of today and the internet of tomorrow.

Heterogeneity is problem number two. So far, there is no standards body working simultaneously on, for example, clothing and cars in a network. Many of the other major devices of the future internet will be similarly diverse.

Complexity is another issue, and is the key theme facing the design and deployment of a system on this scale. Dynamism, the constant creation and destruction of networks and services, will be another feature of the

future internet, one that poses a whole new set of problems.

Bionets is a concerted European effort to overcome these obstacles. It comprises major European players in the telecommunications space, companies like Nokia, Telecom Italia and Sun Microsystems, and it enjoys a budget of nearly EUR 7 million, the lion's share funded by the EU.

Bionets has been studying the problem for the past three years and believes it has come up with an answer to the question: How do you develop solutions for a very large-scale, heterogeneous, dynamic and complex problem like the future internet?

'You look for existing solutions to similar sorts of problems, and you apply those answers to your questions. You can see the same sort of large-scale, heterogeneous, dynamic and complex organisation in nature,' explains Miorandi.

Bionets takes its cues from the natural world, evolution and DNA to tackle some of the fundamental scientific and engineering problems presented by the future internet. 'We need to introduce autonomic properties at the network and service levels, software and protocols, and devices capable of operating reliably but independently,' Miorandi believes.

Take the human heart. It beats reliably and keeps its host alive for decades, all without any conscious intervention or control. Bionets' networks would work in the same way.

The project succeeded in developing its technique by creating information filtering

protocols, data dissemination protocols and data cloud protocols that combine and separate according to the specific needs at the time.

This approach is 'bottom up', where the devices, or ultimately the services, set up the appropriate network in the appropriate context to ensure the most robust, secure and useful con-

nection possible. This contrasts sharply with the traditional engineering approach to networks, which was 'top down', designing systems to fulfil particular functions.

The project has made some real progress, and it has helped create new trends in computer science and engineering. But it has also hit some real hurdles. 'We were sure we would be able to develop solutions to the problem of dynamism — of rapidly changing devices, contexts and situations — but we didn't completely solve that issue, though we made some good progress in that direction,' reveals Miorandi.

The project still has several months of its four years to run, but Miorandi does not believe they will be able to solve completely this particular problem. That said, the team has created a foundation upon which other researchers can build.

And up to this point of the project, there have certainly been many more successes than disappointments. Among their impressive results was a practical technical solution to opportunistic communication in mobile environments, called U-Hopper. This work sprung out of the basic science research the team conducted.

'We are engineers, so we love to do the fundamental scientific research; but we like to play with toys, too,' explains Miorandi. U-Hopper started as a proof of principle and a chance to play with some toys for the Bionets team, but the work could lead to some very valuable commercial applications, too.

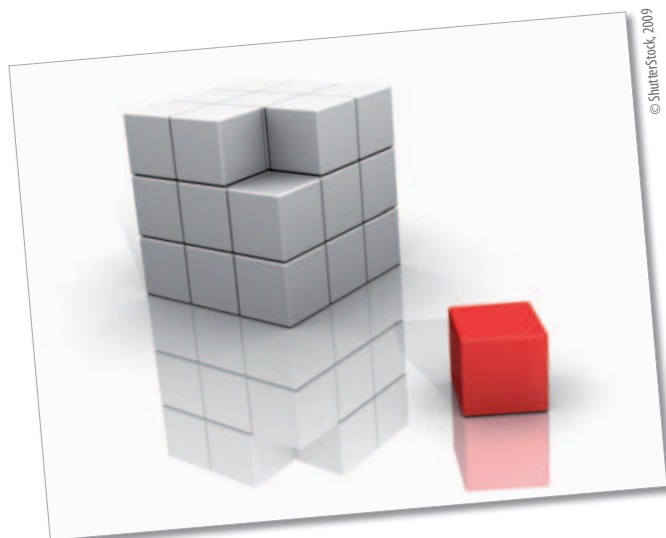
Bionets also helped to found four conferences: Bionetics, Autonomics, Inter-Perf, Physcomnet. 'Among those, our flagship event is certainly Bionetics — an event that well reflects both the multidisciplinary flavour of our research in Bionets as well as our attempt to build a community working at the junction of biology, computer science and software engineering.'

The team produced high-quality research, too, with over 100 papers published in the first three years by the Bionets consortium, achieving a best paper award at 'IEEE Globecom 2007' and one at 'Bionetics 2007'.

All in all, the project has managed to get through an impressive workload well before it is due to finish, and the work offers some promising routes to the future internet of everything, to Web cubed.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90442>



## Shielding electrical contacts against corrosion

*The collaboration between electrical engineers and experts in surface and organic chemistry has allowed the development of a new type of permanent organic layer for metallic surfaces. Its application on electrical contacts promises to minimise degradation due to friction and corrosion.*

Contact members of metal-metal connectors designed for low voltage and current applications are subjected to fretting wear and corrosion, which in turn affects their durability. In automotive and telecommunication electronic systems, these are mostly made of a metal base coated with a nickel layer on which a thin gold film is deposited.

To improve reliability and performance of electrical connectors with a gold outer coating, compounds that bind to the finishing layer and form well-defined monolayers were used in the past. The 'Bilayer molecular coating' project partners sought to exploit

the outstanding properties of lubricants in the development of an alternative protective treatment for electrical contact materials.

Deposition methods of an organothiol monolayer, chemically bound to the metal surface of electrical contacts with an overlying lubricant film was developed at the École supérieure d'électricité (Supélec), France. The resulting assembly, referred to as a bilayer molecular coating, exhibited a self-healing capacity through a reserve of molecules dissolved within the lubricant layer.

Organothiol molecules are capable of reducing ultra-thin layers of metal oxides that could be formed on the surface of gold or other noble coatings, because of fretting or atmospheric corrosion. They migrate from the viscous fluid towards the metal surface to react with metal oxides and yield products that can be rinsed off, exposing a clean surface ready for subsequent modification.

Bilayer molecular coatings with a supernatant film of perfluoropolyether (PFPE) lubricant could be formatted either in a one- or two-step process. Their quality, however, was found to be dependent on the method of deposition.



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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4809

## New coatings for high-performance cutting tools

*Drivers of change in metal machining technologies, including requirements for reduced consumption of cutting fluids and protection of the environment, have introduced high-speed machining of workpiece materials. This change however, requires cutting tools tailored to endure the new machining conditions.*

The overriding aims for manufacturers of metal cutting tools have been improved efficiency and precision of metal machining processes with reduced costs. For this purpose, they are working together with their customers and developers of non-traditional and high-performance workpiece materials to apply the knowledge that is needed to optimise tool manufacturing technologies.

The aim of the EU-funded Hipercut research project was to develop new coatings for complex-shaped tools which can be used for high-speed machining. The combination of the outstanding chemical, thermal and tribological properties of cubic and hexagonal boron nitride, diamond, graphite and diamond-like carbon has motivated intensive investigations performed on boron-carbon-nitride (B-C-N) compounds.

Scientists at the Instituto de Ciencia de Materiales de Madrid, Spain, expected that B-C-N films would exhibit high adhesion and resistance to oxidation at high temperatures. To obtain B-C-N compounds in thin film form, different physical vapour deposition (PVD) techniques had been used. For the phase change from solid to vapour, the bombardment of the material target with high-energy ions was identified as an efficient way to produce vapour without the need for heating.

The ion beam-assisted deposition (IBAD) technique offered the possibility of controlling the bombarding parameters. More specifically, independent sources from boron (B) and carbon (C) were combined with nitrogen (N) ions to allow for full control over composition and bonding structure of

ternary B-C-N compounds. The increase of the C flux during evaporation gave rise to an increase of the C content in the film. Furthermore, it led to the transformation of the bonding structure from a hexagonal-like configuration to a diamond-like material.

Several samples with high-carbon content were prepared for nano-indentation experiments, which revealed decrease in the wear rate with the introduction of carbon in the film. The advantage of BC<sub>x</sub>N films over ta-C (tetrahedral amorphous carbon) and other films was verified to be the lack of internal stress since there was no evidence of delamination even for a film thickness above 1 µm. Their mechanical properties included a hardness and elastic modulus around 20 GPa and 200 GPa, respectively, which may open the way for future industrial applications.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4771

## Gas identification from optics of thin gold films

*Experimental proof of variations in the optical properties of nanostructured and nanocomposite media has been provided within the framework of the Nanophos project. Such lossless alterations in materials exposed to specific pollutant agents could, in the future, allow the implementation of innovative working principles for a new class of 'smart' gas sensors.*

Sensor devices for the detection of small concentrations of reducing gases are required to have high sensitivity and selectivity to gas components, in addition to a fast response time. Furthermore, they are expected to operate reliably under a wide temperature range in order to cover the ever-growing needs for monitoring air pollutant emissions from industrial and laboratory processes.

Aiming beyond the established working principles of gas sensors, research within the Nanophos project focused on the use of nanostructured and nanocomposite media to improve their effectiveness. The non-linear effects of light-matter interactions in materials exposed to a chemical environment were, for this purpose, investigated at the laboratories of the Foundation for Research and Technology, Greece.

More specifically, thin films of noble metal nanoparticles deposited on or embedded in different host dielectric materials attracted the interest of researchers. Their inherent large non-linear optical response, which can be further enhanced through the excitation of surface plasmons by light, made them ideal candidates for optoelectronic gas sensors.



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Parameters like the thickness of films, the size and morphology of deposited nanoparticles as well as the pre-treatment of substrates can, however, significantly influence their non-linear optical response. For determining the optical susceptibility of continuous films of gold and ultrathin gold films exhibiting an island-type morphology, the optical Kerr effect technique, Z-scan and optical limiting technique were used.

Significant variations of the non-linear optical properties of gold films upon exposure to specific pollutant agents were for the first time observed experimentally. The potential of controlling the conditions under which thin films of gold are prepared, and subsequently regulate their optical properties, was also investigated.

This line of research is envisaged to open new avenues for achieving a high level of sensing discrimination between gases such as nitrogen and sulphur oxides as well as other pollutants.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4739

## Measuring magnetostriction in cobalt ferrite

*Scientists studied samples of cobalt ferrite and Terfenol-D in order to determine their magnetostrictive properties. As a result of this work, a number of unexpected results were found.*

The IELAS project measured and compared the magnetostrictive properties of cobalt ferrite and Terfenol-D to the values given in the literature. Magnetostriction is a property of ferromagnetic materials, which causes them to change their shape when subjected to a magnetic field. Researchers wanted to determine which material would be best suited for the emitter of a novel instrument transducer. Most of the detailed measurements were undertaken using 50 Hz alternating current. The cobalt ferrite sample, which did not have laminations, was in the form of a solid rod 100 mm long and 20 mm in diameter.

The two materials both had larger signal ranges than the 30 kA/m originally specified. The magnetostrictive response in Terfenol-D was always non-linear. However, for cobalt ferrite the result depended on the level of the pre-stress. Zero-crossing was found to occur in both materials, especially when Terfenol-D was employed as the magnetostrictive material. The effect was much less when cobalt ferrite was used and was further reduced in the presence of large

magnetic field strengths, and when large pre-stresses were applied.

The magnetostrictive coefficient for Terfenol-D was found to be nearly 10 times the required value in some tests. For cobalt ferrite the coefficient was less than the specified minimum. Both samples showed hysteresis, where magnetic induction has a delayed response to the changing magnetic field, although it was less pronounced in cobalt ferrite.

Researchers made no direct measurements to confirm the presence of eddy currents, which are electric currents set up by an alternating electric field. However, it was assumed from indirect evidence that eddy currents developed in the Terfenol-D sample. It was believed that these detrimental effects could be avoided in an emitter by using cobalt ferrite, which has low electrical conductivity. The IELAS team concluded that cobalt ferrite was shown to be a better material

for the emitter than Terfenol-D in four out of the five criteria examined.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4792

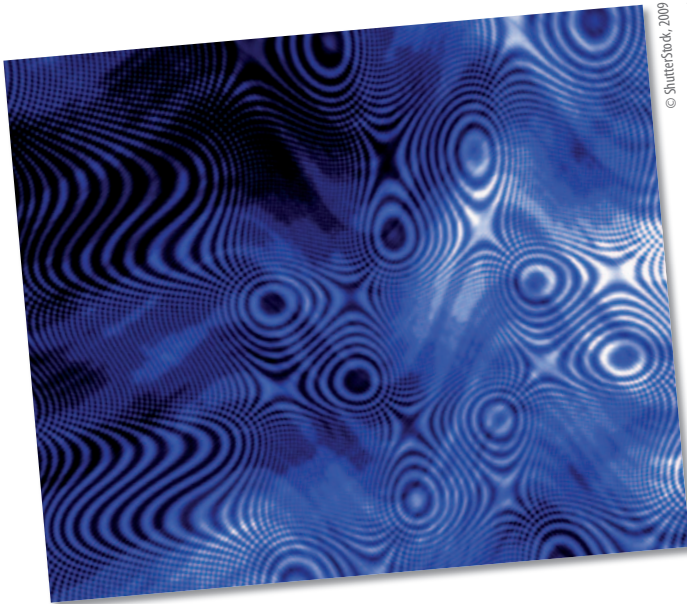


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## Optical diagnostics for gas sensing systems

*When gas components interact with the surface of thin nanostructured films, changes in their inherent properties are observed. This has opened up new possibilities for improving the precise measurement of gas concentration when detection is based on changes in refractive index.*

Nanostructured films of metal oxides possess properties different to homogeneous materials, due to the deliberate engineering of nanoscale features in their structure. For gas sensing applications, changes in their electrical characteristics, influenced by the presence of gases, have been widely exploited.



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The Nanophos project partners have investigated the effects of exposure to different hydrocarbon gases on their optical properties, such as transmittance, refraction and reflection. Their ultimate aim was to identify possible approaches to designing advanced interrogation elements for optical sensors that would

be based on information code in the phase of diffracted light.

An optical measurement system was, for this purpose, developed at the laboratories of Université Aix-Marseille III, France. Due to the ease of operation and high measurement accuracy, a prism-waveguide coupler was employed to evaluate variations in the refractive index of thin, highly transparent metal oxide films.

Refractive indices depend upon the wavelength of the electromagnetic radiation transmitted and therefore, a monochromatic laser beam was used in conjunction with a prism of known refractive index. Coupling light in and out of a waveguide proved to be particularly suitable for obtaining quantitative information on the optical sensitivity of low absorption films when exposed to hydrocarbon gases.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4795

## Keeping children safe in cars

*Through innovative software tools, the CHILD project reached a more comprehensive understanding of injuries experienced by children of different ages who were car occupants in road accidents.*

The number and severity of child casualties from car accidents represents an unacceptably high burden on Europe's society and economy. The fact that such poor progress has been observed in the last decades, despite the normal use of child restraint systems, underlines the high importance of continued child safety research.

When compared to the advancements made in the protection of adult occupants, the crucial lack of biomedical knowledge on injury mechanisms specifically for children can be identified. Biomechanical tests on child subjects are seldom undertaken for obvious ethical reasons. Moreover, a child can not be considered a 'small' adult and a scaling approach would not allow direct transfer of knowledge from adult to child.

The CHILD project was initiated to provide a decisive increase in the basic scientific knowledge that is needed for a more efficient design of child restraint systems. Reconstructions of actual car accidents with fully instrumented dummies and using an anthropometry comparable to children were

instrumental in acquiring the missing biomechanical knowledge.

The possibility of reproducing real-life crash configurations at crash test facilities was evaluated, using a new software tool developed at the French national institute for transport and safety research. This is based on the statistical analysis of vehicle deformations and calculates weighing factors for main parts of the car body structure.

A reconstruction quality score is derived from both absolute values of vehicle deformation and relative values of deformation differences. This composite score offers a valuable estimate of the crash severity in comparison with the actual

road accident, the child dummy responses and the reproduction of probable injury mechanisms.

Correlations between child dummy measurements and child injuries could then be more accurately established, as well as the effectiveness of child restraint systems.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4697



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## Taming Europe's robots

*Europe is the world leader for industrial robotics, but its leading corporations and research institutes need to cooperate more closely to ensure that the continent also leads the world in future robotic applications in the home. One European network paved the way forward.*

Europe's robotics manufacturers lead the world for industrial applications. Meanwhile, the continent's research institutes and universities are producing some of the most innovative, forward-looking and pioneering research in the world.

But the true potential of European robotics remains unrealised because technology transfer from the academic researchers to the industrial producers is not sufficiently robust. It is a vital issue, because many analysts believe that robotics could become perhaps even more ubiquitous than PCs by 2025, with some predicting a robot in every house.

'When you see people like Bill Gates investing in robotics, you realise that the market potential is huge,' emphasises Bruno Siciliano, chair for dissemination of the EURON network of excellence (NoE).

Europe's robot manufacturers and researchers need to get to know each other better. And Europe needs to develop its potential in domestic robot markets if it is to maintain and extend its global leadership in the sector.

EURON, the 'European robotics research network', aims to strengthen links both between individual labs and between labs and industry, and thus broaden the industrial base in the continent's robotics sector. The EU-funded EURON sought to strengthen Europe's academic community, foster technology transfer and identify obstacles and propose possible solutions.

The NoE has been operating for eight years, since early 2001, in two phases. It fulfilled its primary objectives by offering networking opportunities through meetings, a website,

online fora and a regular column in the highly regarded *Robotics and Automation Magazine* of the IEEE. The meetings evolved into EUROS, the 'European robotics symposium'. 'It is special because it is focused on a single track and it allows for a lot of brainstorming and networking,' explains Siciliano.

The network also established a special technology prize, to highlight particularly strong technology transfer demonstrations. One of the most notable award winners, the iDroid, became something of a publishing phenomenon.

The iDroid was a fully functioning, humanoid robot that consumers could build for themselves, simply by subscribing to a 72-issue 'part work' by an Italian publisher, Diagostini. A part work is a magazine series that develops into a complete book or series of books. Each issue offered a new part for the iDroid.

The magazine was a huge seller, particularly in Japan. 'In Japan, which currently leads the world in domestic robots, people are very comfortable with robots that look and act like people or dogs or whatever,' notes Siciliano. 'But in Europe, people like robots to look like machines,' he suggests.

This was just one of EURON's many successes. The network also established a fund to enable labs and teams to carry out a feasibility study for specific pieces of research. One very successful example, called Phridom, looked at the potential for research in physical human robot interactions (PHRI).

Most robots used in European industry are behind a fence for safety, but people have been injured, and even killed, when working on robots during maintenance. Phridom looked at the potential for a solution. Its work was so successful that it became a stand-alone IST project, called Phriends.

EURON also identified two obstacles to closer cooperation between



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labs and companies wishing to undertake a research project, namely investment and trust. 'It can take three person months to prepare a project proposal that has just a 15 % chance of success,' reveals Siciliano. 'SMEs and systems integrators in the industry cannot afford to dedicate personnel to that.'

'Similarly, many of Europe's leading companies are wary of investing money and personnel in unusual, sometimes even seemingly crazy research. Anything that looks beyond or outside their five-year roadmap has little chance of backing.'

The issue of trust is, perhaps, even more of an obstacle. Technical solutions to some robotics problems are a focus of intense competition between manufacturers. As such, the technical breakthroughs represent an enormous commercial advantage, and some manufacturers simply will not give research partners access to special technology.

EURON has gone a long way towards tackling these issues, and the work and discussions are ongoing. Its influence will continue beyond the life of the project, which ended in May 2008. EUROS, its meeting, will continue, as will the links between labs and between labs and industry. It all means Europe should be better prepared to domesticate its robotics industry in time for the markets of the future.

***This is the first of a four-part special series of features exploring European robotics research. You can read part 2 in the next issue of the research\*eu results supplement.***

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90032>



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## Conscientious conformity across the EU

*A study by the LVD project addressed the problems Bulgaria has faced in implementing the European Low Voltage Directive (LVD). Other countries which have recently completed association agreements with the EU could benefit from these findings.*

The Single Market can be defined as the adoption of EU standards and the removal of internal barriers. Membership of the Single Market brings many benefits to countries but it also carries with it responsibilities. Harmonisation of product safety and standards has proved to be one of the most difficult factors to control in the harmonisation process.

EU law conveys this message and outlines measures that must be implemented by newly associated states. Directive 73/23/EEC

(LVD) concerns the conformity assessment of electrical products.

The equally named LVD project was concerned with the implementation of this directive in Bulgaria, when the country was preparing for joining the EU. The researchers conducted surveys with the aim of finding solutions to the existing implementation problems — 250 individuals completed the questionnaires. The sample used was made up of Bulgarian producers and importers, technicians and customers.

The findings presented information regarding the existing situation relating to the Bulgarian conformity assessment bodies. This is a designated body with the responsibility of managing compliance with the LVD. Researchers found that the main difficulties that conformity bodies were confronted with related to the comparatively low level of demand for this service, together with some problems regarding the personnel qualification and maintenance of the quality management system.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4743

## Tailoring technical quality specialisation

*A curriculum for the postgraduate specialisation in technical quality was developed under the umbrella of the EU-funded LVD project. It offers and distributes knowledge and experience in technical quality assurance and related areas in order to advance activities in this field.*

The curriculum was designed based on the needs and requirements of interested partners such as industry, laboratories as well as regulatory and administrative bodies. Consequently, it is made up of technical harmonisation activities, conformity assessment techniques/procedures, metrology, quality assurance and related legislation. In the form of a one-year specialisation study or a custom-made seminar, it offers important information to postgraduate students, industries, services and public servants in particular. The specialisation is an interdisciplinary programme.

In terms of its structure, it is similar to other postgraduate study curricula. That is,

beforehand, every student selects a mentor who is a faculty member of the department, in this case of electrical engineering. The mentor provides student guidance, proposes a topic and, at times, subjects for study. The subjects may be selected; however, the majority of them should come from a specific realm within the field.

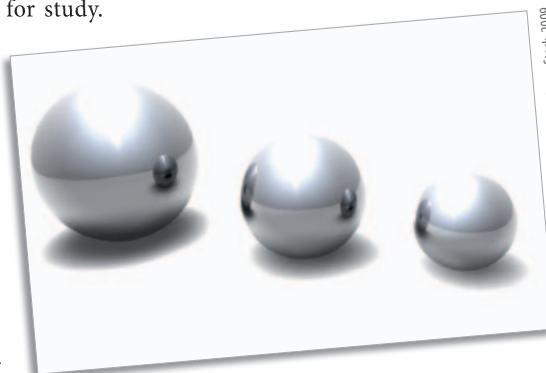
The specialisation is completed once it has been successfully defended before a commission. It is well-suited for postgraduate students who have been in industry or the public sector, i.e. students who are not inter-

ested in an MA or PhD but rather desire a degree as a specialist in the technical quality field. However, the study programme can also be useful for students before their first employment.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4715



## Nanotechnology for enhanced gas sensing

*Aiming beyond the established sensing concepts, the Nanophos project wants to improve the effectiveness of optoelectronic gas sensors by focusing on the use of synthetic nanostructured media.*

Metal nanoparticles (NPs), representing particularly attractive building blocks for functional systems of nanometre dimensions, have been the subject of extensive research within the Nanophos project. With well-defined dimensions and geometry as well as chemical and optical properties, gold NPs promise a myriad of applications, including optical and electronic sensors.

Before they could be used in the design of nanostructured and nanocomposite media exhibiting advanced gas sensing functionality, NPs and NP assemblies would need

to be carefully designed. For this purpose, project partners at the Weizmann Institute of Science, Israel, focused on the possibility to modify gold NPs by exploiting their surface chemistry.

To achieve selective isolation and separation, gold NPs were bound to a polymeric solid support by means of custom-synthesised bifunctional linker molecules. The use of boronic acids ensured that NPs were bound under mild reactions. Furthermore, it introduced elements of chemical reversibility. NPs bound to boronic acid-function-

alised resins could be released back to solution, leaving one (or more) linker molecules on the NPs.

The reversibility of binding NPs to a polymeric solid support may be useful in numerous facets of the NPs' handling, manipulation and separation. Controlled modification of NPs, chemical reactions on immobilised NPs and prevention of NP-NP interactions during chemical manipulation are only a few of the applications that are under further study.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4775

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 the future of innovation

*A conference entitled 'The future of innovation' and organised by the International Society for Professional Innovation Management (ISPIM) will take place in Vienna, Austria, from 21 to 24 June 2009.*

The event will bring together academics, business leaders, consultants and other professionals involved in innovation management. The conference format will include facilitated theme sessions, interactive workshops and discussion panels. Additionally, the event will provide networking opportunities.

The conference will include contributions from academics, consultants and managers on the following topics:

- commercialising and financing innovation;
- methods and tools for innovation;
- measuring and managing innovation;
- organisational creativity and idea generation;
- networks and clusters of innovation;
- collaboration for innovation;
- culture and diversity management in innovation;
- entrepreneurship and intrapreneurship;
- high-growth venturing;
- innovating business models;
- innovation training and education;
- innovation policy and global competitiveness;
- managing virtual innovation;
- value creating networks and communities.

For further information, please visit:  
<http://www.ispim.org/conference>

### Conference on Euratom

*The FISA-2009 conference entitled 'Euratom research and training in reactor systems' will take place in Prague, Czech Republic, from 22 to 24 June 2009.*

The safe operation of nuclear installations is of vital importance for the energy supply in Europe. Moreover, today, it seems urgent to develop a new generation of nuclear reactors to assure sustainability (in particular, integral recycling).

Helping to ensure the safe generation of nuclear power has always been one of the top priorities of the Euratom Framework Programme (FP) research effort. The main objective of FISA-2009 is the dissemination of Euratom FP results and the cross-fertilisation of various disciplines (including training), together with the creation of new science and technology partnerships for follow-up actions.

For further information, please visit:  
[http://cordis.europa.eu/fp7/euratom-fission/fisa2009\\_en.html](http://cordis.europa.eu/fp7/euratom-fission/fisa2009_en.html)

### Conference on transport, atmosphere and climate

*An international conference on transport, atmosphere and climate (TAC-2) will be held from 22 to 25 June 2009 in Aachen, Germany.*

The scope of the conference covers all aspects of the impact of different modes of transport (e.g. aviation, road transport, shipping) on atmospheric chemistry, micro-physics, radiation and climate. More specifically, talks will address some of the following topics:

- engine emissions (gaseous and particulate);
- emission scenarios and emission data bases for transport;
- near-field and plume processes, effective emissions;
- transport impact on the chemical composition of the atmosphere;
- transport impact on aerosols;
- contrails, contrail cirrus, ship tracks;
- indirect cloud effects (e.g. aerosol-cloud interaction);
- radiative forcing;
- impact on climate;
- metrics for measuring climate change and damage;
- mitigation of transport impacts by technological changes in vehicles and engines (e.g. low- nitrogen oxide (NO<sub>x</sub>) engines, alternative fuels);
- mitigation of transport impacts by operational means (e.g. air traffic management, environmental flight and ship routing).

The largest part of the conference will take place in Aachen with a one-day ses-

sion for policy-makers and the media in Maastricht, Netherlands.

For further information, please visit:  
<http://www.pa.op.dlr.de/tac>

### Conference on research management and administration

*The 15th annual conference of the European Association of Research Managers and Administrators (EARMA) will take place in Copenhagen, Denmark, from 24 to 27 June 2009.*

The programme consists of plenary and keynote lectures, as well as a wide variety of parallel workshops dealing with many practical aspects of research management and administration. The main theme of the conference is 'Supporting and sustaining competitive research in Europe'.

Five subject tracks are on the agenda:

- contracts and legal issues — subcontracts, consortium agreements, and post-award intellectual property rights (IPR) management;
- finance — financial rules of FP7, full costing, certification, timesheets, and audits;
- research office services — models of research office support structures, project management, and adding value to proposals;
- research strategy and policy — funding strategies, collaboration between industry and university, and building research capacity;
- governance, ethics and compliance — research misconduct, ethics, and clinical/medical research issues.

For further information, please visit:  
<http://www.earma.org/conference2009/general-information>

### Conference on science and technology in times of crisis

*The Knowledge for Growth expert group will hold its final conference under the title 'Science and technology policy in times of crisis: European opportunities and challenges' on 25 June 2009 in Brussels, Belgium.*

The conference will be dedicated to the following issues:

- how can science and technology (S & T) policy help to recover from a recession and to address the global systemic crises of our time (energy, environment, water, food supply)?

- transition toward the knowledge-based economy, the role of innovation diffusion and smart specialisation;
- governance and reforms in research and development funding in the context of a larger and more heterogeneous EU.

The expert group operates as an independent advisory body to the European Commissioner for Science and Research, Janez Potočnik. All members take part on a personal basis.

For further information, please visit:  
[http://ec.europa.eu/invest-in-research/monitoring/knowledge\\_en.htm](http://ec.europa.eu/invest-in-research/monitoring/knowledge_en.htm)

## Conference on bioinformatics open source

*The 'Bioinformatics open source conference' (BOSC) will be held on 27 and 28 June 2009 in Stockholm, Sweden.*

A variety of open source bioinformatics packages are used by the research community across many application areas and enable research in the genomic and post-genomic era. Open source bioinformatics software has facilitated innovation, dissemination and adoption of new computational methods, reusable software components and standards.

This year's conference will mark the 10th anniversary of BOSC. In order to celebrate this event, the theme is 'Looking back and looking ahead: open source solutions to grand challenges in bioinformatics'. Notably, speakers coming to the event will be prepared to give an informal tutorial on their software. This year's topics include:

- design patterns in bioinformatics;
- regulatory genomics;
- data and analysis management;
- computational grids;
- visualisation.

BOSC is sponsored by the Open Bioinformatics Foundation, a non-profit group dedicated to promoting the practice and philosophy of open source software development within the biological research community.

For further information, please visit:  
[http://open-bio.org/wiki/BOSC\\_2009](http://open-bio.org/wiki/BOSC_2009)

## Symposium on biological surfaces and interfaces

*The European Science Foundation (ESF) and the European Molecular Biology Organization (EMBO) are organising a symposium on biological surfaces and interfaces from 27 June to 2 July 2009 in Sant Feliu de Guixols, Spain.*

Interfaces between synthetic materials and biological systems (biointerfaces) constitute one of the most dynamic and expanding fields in S & T. By definition, the field is highly interdisciplinary, spanning the disciplines of physics, materials science and engineering, chemistry, biology, bioinformatics and medicine.

The symposium will consist of presentations by internationally renowned researchers, complemented by shorter oral presentations and poster sessions by young scientists. The keynote speeches are intended to put the biointerface field in a larger scientific, clinical and social context. A small-group discussion session is also planned to address social and ethical implications of technologies and scientific knowledge being developed and used in this area.

For further information, please visit:  
<http://www.esf.org/activities/esf-conferences/details/2009/confdetail290.html>

## Conference on biomass

*The '17th European biomass conference and exhibition — from research to industry and markets', will take place from 29 June to 3 July 2009 in Hamburg, Germany.*

The conference is committed towards gathering the best expertise to discuss and analyse the present and future dynamics of the global biomass sector. This international conference is aimed at stimulating public discussion and promoting awareness of the biomass community.

Scientists, industry, suppliers, funding bodies and decision-makers are invited to meet the more than 1 500 expected attendees.

For further information, please visit:  
<http://www.conference-biomass.com>

## School of journalism and communication on the topic of energy

*The first edition of the 'International school of scientific journalism and communication' will be organised from 6 to 9 July 2009 at the Ettore Majorana Centre in Erice, Italy.*

The school is based on lectures, working sessions and other activities, held on a given theme and other topics by international experts in the fields of science, journalism and communication. The central theme of the school in 2009 is energy. The aim is to provide on the one hand the basic knowledge and future prospects for energy in the world and on the other the most advanced tools to communicate this topic to the larger public.

For further information, please visit:  
<http://pcaen1.ing2.uniroma1.it/SchoolJournalismErice>

## Conference on energy for a clean environment

*The conference 'CleanAir: energy for a clean environment' will take place from 7 to 10 July 2009 in Lisbon, Portugal.*

The conference will deal with interconnected themes covering the reduction of local and global environment degrading emissions aiming for a better integration of supply and demand.

The CleanAir series of events have taken place in Portugal since 1989. These conferences have gained a lot of interest since their first inception and are being reorganized with a renewed organising committee.

The conference is a platform to describe, compare and evaluate new and innovative technologies, which maximise energy conversion while minimising undesirable emissions. Attention is also given to the improvement of existing energy systems which will still be used for a long time. Both academic and applied contributions will be welcome but particular efforts will be made to stimulate papers from industry and end-users in general.

For further information, please visit:  
<http://carnot.ist.utl.pt/~cleanair>

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