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RESULTS SUPPLEMENT

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Stilling the storm

This year has seen many parts of the world awash with catastrophic storms and floods, causing serious hardship to inhabitants through water damage. In parallel, many EU citizens are being deprived of quality drinking water, as natural resources become scarcer and more expensive. On a happier note, leading researchers across Europe have taken these issues by storm and are actively looking at new ways to assess high-risk situations. Raising the quality of life and protecting citizens are major EU policy goals and give us hope for a brighter outlook.

*All this is possible thanks to EU funding, with the CORDIS information services keeping us up to date through publications such as the research*eu results supplements.*

In this issue, toxin-free wine is served as the aperitif for the biology and medicine section. Wine production is of vital importance within Europe and the 'Wine-ochra risk' project will aid growers to improve their cultivation methods. Traditionally, wine goes with cheese, and the Decarboxylate project offers new ways of producing better cheese by controlling fermentation.

This month's energy section features the Superhydrogen project which exploited hydrogen's attraction to palladium in order to develop a novel membrane facilitating pure hydrogen production. The section gathers speed with the Afforhd project's account on alternative fuel injection to boost diesel engines.

Preparing for storms, this issue's cover theme, is vital in today's environment. The Daywater project explains how the risk of storm water and its effects can be properly examined. Early warning and civil protection are the focus of several other projects, such as the landslide hazard assessment by the OASYS researchers.

A burning issue in the IT and telecommunications section is forest fire surveillance. Real-time monitoring of a fire can be invaluable for forest fire fighting, and the Comets project built a distributed communication system for coordinated wildfire monitoring.

In the industrial technologies section, researchers looked upwards. Congestion in the skies is an increasingly worrying aspect that traffic controllers and pilots have to deal with. The EU-funded Sourdine II project investigated innovative means to minimise risks in the sky.

We hope that you will enjoy this month's selection of projects and their results. The entire news range from the Technology Marketplace (TMP) and ICT Results service is also accessible online.

*You are more than welcome to address any comments and suggestions on this issue and research*eu publications in general to: research-eu-supplements@publications.europa.eu*

The editorial team

Erratum

*The ISSN of this series is 1830-8864, not 1830-8664 as indicated in the first five issues of this year.
The online version of all issues carries the correct number, 1830-8864.*

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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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Model to prevent toxins passing from vine to wine

Ochratoxin A (OTA) can cause kidney damage and is a potent renal carcinogen. One of its sources is wine made from grapes infected with Aspergillus carbonarius (A. carbonarius).

Wine is a fermentation product and as such it is prone to spoilage by a range of micro-organisms. One of these is the black *A. carbonarius*. Not only does the body of the fungus or mycelium grow on the skin and into the flesh of the grape, but the toxin OTA is produced — a source of concern for wine producers and consumers. Wine production is of vital importance within Europe and the EU-funded project 'Wine-ochra risk' has accordingly researched into the fungi responsible for this type of spoilage.

Scientists based at the Italian Università Cattolica del Sacro Cuore in Placenza specifically researched into *A. carbonarius* as the main OTA-producing fungus. Their work covered the conditions that favoured the growth of the fungus and these were determined by both by field trial and laboratory experiment.

The team developed models for the relationships between spore germination and three environmental components: time, temperature and relative humidity. As expected, there was a direct relationship between increased temperature and growth rate. Susceptibility to infection was also affected by grape variety.

The presence of other pathogens also aided fungal colonisation. First, the vine moth *Lobesia botrana*, which damages the skin and whose larvae burrow through the grape and can act as vectors distributing the fungal spores. The other organism that aids the establishment of *A. carbonarius* is powdery mildew. This fungal pathogen causes rusty spots on the outside of the fruit but in badly affected infections, the skin may split. This therefore causes a physical opening for any *A. carbonarius* inoculum to enter.

Further research as to the role of some factors, such as the basis for variety susceptibility, is required for this complex process of colonisation of a fungus in its pathogen. The study will aid growers to improve their cultivation methods, particularly in regard to the presence of other pathogens.

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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Finding the reasons for histamine in wine

Wine production is of major economic importance in Europe. Scientists from the European project Decarboxylate have investigated wine spoilage by biogenic amines.

Histamine, a biogenic amine, is produced by fermentation from the amino acid histidine. When ingested, it can cause allergy-like symptoms such as flushing, headache, palpitation, itching, wheezing, difficulty in breathing and diarrhoea. Unfortunately in wine, the presence of alcohol and other biogenic amines can exacerbate these effects.

Not surprisingly, the wine industry has set a strict limit on histamine content for wine producers of 2 to 10 mg/l. The histamine-producing pathway is not present in all lactic acid bacteria (LAB) strains. Accordingly, scientists at Bordeaux University surveyed more than 250 wines in their famous wine-

producing region. They tested for the presence of histamine-producing LAB.

A specially developed real-time quantitative polymerase chain reaction (PCR) method was used to analyse the vintage wine. The stark reality was that only 2 % of the wines were free of histamine-producing bacteria, although not all these would be unacceptable.

To elucidate this, the team then investigated the actual concentration of bacterial cells in some of the spoiled wine. They found that when there were over 1 000 cells per litre, concentrations of the amine were significant (over 2 mg/l). This was the case in around 7 of the 10 wines.

To see if there was a geographical link, they mapped the distribution of histamine concentration in the different wines from different vineyards. They concluded that some localities produced wine that was more prone to spoilage. This however could be attributable to practices and wine composition, not geographical distribution.

Identifying the causes of histamine production in wine could be the key to keeping concentrations at an acceptable level. This means that less wine will be categorised as unsuitable for consumption and good news for the wine industry as a whole.

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

Collaboration sought: further research or development support.

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Frequent acronyms

ERA European research area
FP5/6/7 Fifth/Sixth/Seventh Framework Programme of the European Community for research, technological development and demonstration activities

ICT information and communication technologies
IST information society technologies
R & D research and development
SMEs small and medium-sized enterprises

Detection of lactic acid bacteria in cheese

The dairy industry uses lactic acid bacteria (LAB) as fermentation starters. These bacteria begin the fermentation process when preparing foods such as cheese and yoghurt.

The metabolic activity of some strains of LAB can result in the production of toxic biogenic amines (BA). Eating foods containing high levels of BA can result in increased heart rate and blood pressure. Such a response may even threaten the life of the person who consumed it. This is particularly the case for individuals suffering from a deficiency in the intestinal amino-oxidases. Tyramine is the most commonly occurring BA in cheeses and the most concentrated one. It is from the decarboxylation of the corresponding amino acid, tyrosine. This is carried out by enzymes produced by micro-organisms found in the food.

The Decarboxylate project has developed a fast, simple and sensitive method for detecting tyramine producing LAB throughout the food chain. The creation of tyramine is more closely connected to the strain of bacteria used, rather than the species. The bacteria which generate tyramine could be from contaminants in fermented food or part of the starter culture. Therefore, it was extremely important to identify the strain of bacteria responsible for producing tyramine. In this way the contaminants will not be used in the starter cultures.

Consumer demand has been the driving force behind healthier foods. One result

has been a growing interest in techniques for detecting BA producing micro-organisms in foodstuffs. The method developed by Decarboxylate enabled identification of tyramine-producing strains of bacteria by polymerase chain reaction (PCR) analyses, through the use of tdcA primers. Use of the PCR technique allowed possible tyramine-generating strains of bacteria to be detected in milk and cheese, and during the milk fermentation process.

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

Collaboration sought: licence agreement.

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Genetically engineered lactic acid bacteria

Molecular biologists with Spain's Consejo Superior de Investigaciones Científicas were able to improve the properties of several strains of lactic acid bacteria (LAB) through genetic engineering.

LAB are used to ferment a number of different food products, primarily dairy but also goods such as wine. The Centro de Investigaciones Biológicas of the Consejo Superior de Investigaciones Científicas (CSIC) coordinated a research project to genetically manipulate LAB. Their aim was to emphasise desirable traits while at the same time eliminating potential health threats.

In the context of the Decarboxylate project, which was funded by the 'Life quality' programme, several different gene transfer methods were investigated in order to overcome obstacles associated with LAB. Considerable progress was made as CSIC generated a new strain of *Lactobacillus lactis*

encoded with a highly beneficial citrate transport system.

The work programme of the project focused on identifying expression vectors suitable for food-grade applications. For example, the genome of *Lactobacillus casei* was enhanced with built-in protection against the Norwalk virus, which is often associated with food poisoning.

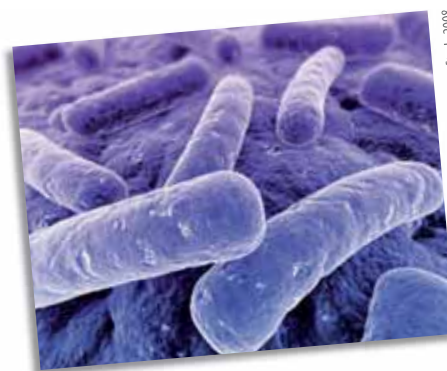
In addition, genetic manipulation for industrial purposes was also carried out. Specifically, a gene from *Pediococcus parvulus* that produces an exopolysaccharide, which possesses attractive prebiotic attributes, was successfully transferred to *Lactococcus*

lactis. CSIC and its Decarboxylate partners have applied for patent protection for their new discoveries.

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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Multidrug resistance in E. coli in Bolivia and Peru

Multidrug resistance (MDR) enables disease-causing micro-organisms to resist certain drugs and chemicals that are aimed at eradicating them. This is of particular concern to countries that have limited resources for combating the problem.

Resistance in *Escherichia coli* (*E. coli*) was studied using molecular analysis. Particular emphasis was placed on identifying the genetic makeup of the cell and identifying useful markers for carrying out studies in the wider population. The Antres project also investigated the distribution of MDR and genes for resistance for *E. coli* in young children in Bolivia and Peru. From a large random survey, 9 out of 10 colonies of *E. coli* were observed to show multiple drug resistance.

The two most common MDRs involving resistance to four and five antibiotics could be transferred together during conjugation experiments. This mimics the situation when genetic material is transferred through direct cell-to-cell contact. The Antres project studied acquired resistance to sulphonamides and recorded the presence of the *sul3* gene for the first time in the Americas. In addition, samples of four ceftriaxone-resistant *E. coli* were collected from urban areas in Bolivia and Peru. These samples were found to con-

tain CTX-M type enzymes, which was the first time they had been reported in these two countries. CTX-M-15 enzyme was also identified for the first time in Latin America.

The different mechanisms behind the spread of resistant *E. coli* are highly complex. The project's findings underlined the major challenges faced as a result of antimicrobial drug resistance and emphasised that the phenomenon must be properly monitored and controlled.

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

Collaboration sought: further research or development support.

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Innovative intervention of antibiotic use

In an effort to reduce widespread antimicrobial use, an intervention campaign was launched to educate providers and increase public awareness of the benefits and risks of antimicrobial therapy.

The irrational use of and consequent bacterial resistance to antimicrobials pose significant public health concerns particularly in low-income countries. In light of this, the Antres project has examined antimicrobial use and resistance in healthy children in both urban and rural areas of Bolivia and Peru.

Part of the project's efforts included the goal of reducing antimicrobial consumption through education and information regarding antimicrobial therapy. This was established through an intervention campaign which involved the design of the 'Information-education-communication' (IEC) package. The package was created in line with

problems of uncontrolled use and resistance which were discovered by conducting household surveys, antimicrobial resistance screening, genotypic analysis and influencing factors during pre-intervention.

The package consisted of a multi-layering of activities in three steps: academic detailing, peer network and community intervention. The activities were carried out sequentially for at least 18 months in both Bolivia and Peru. The intervention campaign addressed journalists, teachers, students and families through the use of marionettes, the-

atre pieces, puppets, radio spots and mass media. Additionally, posters were distributed with messages aimed at self-medication and abidance to treatment.

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

Collaboration sought: financial support.

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Effective treatment for narrowed airways

Asthma and chronic obstructive pulmonary disease can severely affect a patient's quality of life. Scientists with the European project CARED researched into the use of bronchodilators and their effects on exercise capacity.

Chronic obstructive pulmonary disease (COPD) is a condition where the airways become narrower and shortness of breath or dyspnoea occurs. This is usually due to pollution with noxious gases or smoking. Chronic asthma also causes airflow limitation. These are both major causes of disability due to lack of ability to exercise and carry out daily routine activities.

The action of inhaled bronchodilators is to increase exercise capacity by reducing lung overinflation (or dynamic hyperinflation). However, inhalers are not found to be effective in all patients and exercise capacity can be reduced. Project partners from the Politecnico di Milano in Italy aimed to find

out the reasons for this condition which can hamper a patient's recovery.

A trial was conducted on 18 patients with COPD. Salbutamol and saline by inhaler were applied in a double-blind randomised crossover experiment. Variables measured included forced vital capacity or the volume of air that can be forced out the lungs and functional residual capacity. Overall, this is a measure of how much air is left in the lungs after a forced exhalation. At rest and during exercise, a non-invasive method of measurement, optoelectronic plethysmography (OEP), was used to determine breathing pattern, chest wall dimensions and extent of dyspnoea.

Measurements showed that the bronchodilator improved forced expiratory flow in most patients. However, in those that showed less overinflation of the lung, there was a decrease in abdominal compartmental volume which reduced their capacity to exercise.

For effective treatment of COPD, an understanding of the dynamics of chest wall muscle mechanics is essential. The identification of patients with reduced exercise potential is important, so that therapy based on increasing chest wall capacity can be combined with the use of bronchodilators.

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

Collaboration sought: information exchange/training.

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Gaining insight into hyperthermophile DNA

DNA replication remains perhaps the most fundamental biochemical activity in all living organisms. Expanding our knowledge base on this important biochemical reaction can also prove beneficial for a number of industrial applications.

The EU-funded Repbiotech project concentrated on shedding light on every aspect of DNA replication, including the enzymatic apparatus that is utilised during replication. In-depth investigations aimed at elucidating all aspects of the replication process could reveal new insights at the genetic as well as protein level.

Project partners at the Karolinska Institute studied the hyperthermophilic micro-organism *Pyrococcus abyssi*. Due to their ability to

live and survive in extremely high temperatures, their molecular biology poses special interest to scientists. For normal monocular forms of life, the temperatures at which *Pyrococcus abyssi* lives and replicates would mean instant death and of course DNA denaturation.

The study of the enzymatic complex associated with DNA replication in *Pyrococcus abyssi* revealed a series of novel interactions as well as peptides. Scientists focused on

elucidating the crystal structure of the mini chromosome maintenance (MCM) complex as well as of the DNA nuclease enzyme.

These new developments in the area of DNA replication research provide new avenues for growth for the industrial applications field and also the pharmaceutical community. This line of research could indeed prove to be the first in a series of new-generation DNA replication inhibitors against a number of pathologies.

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

Collaboration sought: information exchange/training.

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Putting a virtual doctor in the ambulance

A new ambulance communications system will enable doctors to diagnose and begin treating critically ill patients before they reach hospital.

Diagnosing and treating a critically ill or injured patient as early as possible can mean the difference between life and death. A new communications system between a moving ambulance and its hospital base allows the simultaneous transmission of bandwidth-hungry video and ultrasonic images, telephone communications and patient data, all at the same time.

Medical teams can therefore gather vital and detailed information about the patient's condition and advise the ambulance team on patient treatment as they rush towards the hospital.

The ambulances transmit and receive high-quality data over WiMAX, a microwave access technology that can deliver data at up to 75 Mb/s over a range of 70 km between fixed points (802.16d), or its mobile version can provide 15 Mb/s over a 4-km radius (802.16e).

'If you are transmitting data in high quality, it is very important that you don't lose any bit of information,' says Enrico Angori, a leading

researcher on the WEIRD project. 'WiMAX is the cheapest channel to use and the channel that can deliver the best quality of service.'

WiMAX is not new, but the research team on the EU-funded WEIRD project extended the resilience and flexibility of the WiMAX technology and created a user-friendly package that can easily be used in ambulances by non-computer specialists.

'The main part of our work is to make it easy for end-users to make use of the benefits of new technologies like WiMAX,' explains Giuseppe Martufi, another member of the WEIRD research team.

The team achieve this by developing software that hides the complexity of the configuration of the end-to-end communication channel, whatever the different equipment or different versions of WiMAX used. It means that the paramedic onboard the ambulance can quickly and easily establish an end-to-end communication path without specialist training, allowing them to concentrate on what they do best — saving lives.

Bandwidth can be reserved for the ambulance's critical communications using a protocol called Diameter that identifies data traffic and prioritises it, ensuring communications are not blocked by low-priority data traffic, such as e-mails.

One of the most important features of the ambulance communications system is its ability to create end-to-

end links between two points by seamlessly integrating the WiMAX signal with the other wireless communication technologies encountered, such as mobile telephony.

The WEIRD researchers developed software that takes advantage of the features of 'next-generation networks' (NGNs). NGNs layer information, decoupling the applications from the underlying transport stratum. Whatever the underlying network, the ambulance's signals will be passed seamlessly, end to end.

A few years ago, developers had envisaged global WiMAX networks replacing our present communications infrastructures. Increasingly, WiMAX is being viewed as a complementary technology to existing wireless communication access channels.

So, the successful seamless integration of WiMAX with 'media-independent hand-over' is an important step forward.

Not all applications are designed to run on NGNs. For these, the research team built a series of adaptors — known as WEIRD agents or WEIRD application programming interfaces. WEIRD agents allow non-NGN applications to take advantage of the enhanced quality of service and seamless mobility features offered by the ambulance communications system.

WEIRD received funding from the EU's Sixth Framework Programme (FP6).

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89932>

See also page 19
(Monitoring against another Pompeii)



Dental data predicts onset of osteoporosis

Osteoporosis is a major concern especially in an ageing population as in Europe. Under the umbrella of the European project Osteodent, researchers have investigated the validity of using dental radiographs as a diagnostic tool.

The condition of osteoporosis where bone mineral density is reduced means that the patient may be more prone to fractures and breaks. Unfortunately, this situation may only be apparent once the bone has been broken, resulting in a large cost for health care and time for convalescence for the sufferer. The answer is for therapy to be applied but diagnosis by bone densitometry is not readily available for everyone.

The Osteodent project aimed to investigate whether dental radiographs could be used to predict bone mineral density. They used data from 600 pre-menopausal women to analyse

the reliability of using dental radiographs. Results of bone densitometry scans from spine and hip were compared with measurements from dental radiographs. This was based on the premise that the two-dimensional trabecular pattern can reliably reflect changes in the three-dimensional dimensions of the jaw bone.

A Netherlands-based team from the Academic Centre for Dentistry Amsterdam (ACTA) aimed to test software they had developed to analyse the accuracy of prediction of bone mineral density (BMD) from changes in the trabecular pattern. The initial processing of information from the large number of radiographs was

automated. This enabled the team to include radiographs that incorporated a small region of overlapping teeth. Analysis showed that this did not affect the outcome of the parameters in the image. A large range of images could therefore be processed and the full data set was therefore included in the analysis.

Analysis using software for the reliability of prediction of BMD values from the trabecular pattern showed a range of change from 0.77 to 0.82. These results then indicate that dental radiographs can be a reliable method to predict BMD values. Moreover, this is a more accessible method than bone densitometry.

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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Viral vectors for tumour capillary inhibition

Tumour development depends in part on the development of new blood vessels or angiogenesis. A team of scientists working under an EU project have researched into prevention of this process using viral gene vector therapy.

Angiogenesis, whereby the development of new blood vessels is initiated, occurs in many processes. For example, the first or proliferative phase of wound healing is characterised by angiogenesis and forms a vital part of tissue regeneration. However, angiogenesis occurs in less desirable situations like tumour development and rheumatic diseases.

The extent of capillarisation and its density gives the tumour its ability to become metastatic and spread to other organs. In the drive to find effective therapies for cancer, the EU-funded project 'Anti tumor angio-

genesis' investigated the molecular basis for the initiation of blood vessel development.

Angiogenesis is under the control of four proteins in the endothelial layer of blood vessels that control the signals for cell multiplication, migration and capillary formation. The aim was to determine the molecular basis for these signals and thereby develop therapies.

The project team based at University of Groningen specifically used an adenovirus as a vector to target the endothelial proteins responsible for vascularisation. All in all, three strategies were used to target the proteins. They also devised methods to shield the virus from the immune system.

An adenobody was created by fusion of a peptide and an antibody (S11). The peptide guided the virus to the cell surface and growth receptors. The virus was shielded from attack by the immune system due to the antibody component. Secondly, the addition of polyethylene glycol (PEG) to the virus to produce a PEG molecule was a means of rendering the virus unrecognisable to the immune system. As in the adenobody trial, a peptide anchored to the PEG molecule targeted the virus to cell surface receptors.

Genetic modification was shown to have the edge over pegylation and the use of adenobodies.



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This yielded a stable structure which was not affected by external factors. The modification was successful in targeting integrins, cell surface receptors.

Knowledge of the biochemical pathways in angiogenesis, efficient targeting of proteins involved and shielding from the immune system all form the basis of an effective anti-tumour therapy. Adenoviral vectors for delivery of specifically modified molecules can act as effective modifiers of undesirable processes like angiogenesis.

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

Collaboration sought: information exchange/training.

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New method for the oxidation of saccharides

A new technique for the oxidation of mono- or oligosaccharides was developed by the Heparanase project.

The enzyme heparanase acts at the cell surface or in the intercellular matrix to break-down heparan sulphate (HS) molecules into oligosaccharides. HS is found in all animal tissues and regulates a number of biological activities. These include the growth of new blood vessels (angiogenesis), blood coagulation and tumour metastasis, when cancerous cells spread from one organ to another. Inhibiting the production of heparanase is considered to be a promising strategy for the development of new anti-cancer drugs.

This was achieved by the Heparanase project consortium by mapping binding

sites of heparanase for HS and understanding how HS-like polysaccharides interact with enzymes, both as substrates and inhibitors. The heparanase inhibiting properties of polysaccharides were boosted by producing sulphation patterns optimised for antimetastatic-antiangiogenic activity. These targets were achieved by investigating the inhibition of heparanase with both natural and synthetic HS-like oligo-/polysaccharides and its effect within living cells.

A new method for the oxidation of the primary hydroxyl group of mono- or oligosaccharides was developed by a

Heparanase team from the University of Milan. It comprised two stages, the first being the oxidation to aldehyde with o-iodoxybenzoic acid (IBX). This was the first time that this method has been applied to carbohydrates. The second stage was to further oxidise to form the carboxyl group. This methodology enabled the efficient synthesis of hexuronic acid-containing disaccharides. The resulting compound had the framework of a glycosaminoglycan repeating unit.

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

Collaboration sought: joint venture agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4202

Cow diets for healthier milk

Conjugated linoleic acids (CLAs) have been hailed as a preventive agent against cancer, heart disease and obesity. A European research team has been investigating the optimum bovine diet to encourage their production in cow's milk.

CLA is formed in the rumen and mammary gland of cattle by the action of an enzyme stearoyl-CoA desaturase on a fatty acid. Needless to say, cow's milk forms a very significant part of our diet. The cow has the ability to synthesise CLA in the rumen and mammary gland. The overall

aim of the project Biocla then was to encourage the cow, through diet and general husbandry, to produce as much CLA as possible.

Studies by project partners at MTT Agrifood

Research in Finland examined the effects of two dietary supplements on the production of CLAs in milk. First, they studied the impact of fish oil that inhibits the hydrogenation of the necessary precursor fatty acids in the rumen. Secondly, selected plant oils were provided as a dietary supplement in order to see their effect on the passage of fatty acids from the rumen and the final fatty acid composition of milk.

A combination of sunflower, linseed and fish oil at different levels were fed to the cattle in a basic diet of grass silage and a group with no oil added acting as a control. The addition of oils in the diet affected intake and in the case of fish oil, reduced milk fat but not yield and milk protein. In the case of fish oil with sunflower or linseed oil, milk fat and protein and overall yield were reduced.



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Inclusion of oils significantly affected the composition of milk fatty acids. Interestingly, it was characterised by a reduction of fatty acids that are synthesised in the cow 'de novo', that is from simple molecules, not the conversion using the stearase enzyme. However, the milk fat CLA content is enhanced when fed on a silage based diet with fish oil. Linseed oil increases concentration further but not when combined with sunflower oil.

This investigation shows how important the relative amounts and type of oil supplement can be when inhibitory fish oils are used as a supplement. The results of this research would seem a significant step in making milk, an already healthy drink, even healthier.

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 > 4218

Cheese making preserves even more nutrients

A body of evidence has accumulated to suggest that conjugated linoleic acids (CLAs) are highly beneficial nutrients. The EU-funded project Biocla has researched into how their concentration can be maximised during food processing.

CLAs have attracted the attention of nutritionists due to research results indicating they prevent cancer and heart disease. Health benefits may also include lower blood sugar and reduced accumulated body fat. Accordingly, project partners in Biocla have performed studies to optimise production of CLAs in dairy products.

One of the crucial factors involved in ensuring that the nutrients reach the consumer's table, however, is to develop food processing methods that preserve the CLAs. Milk is one of the prime dietary sources but its processed products like yogurt and cheese occupy a much more prominent position on the supermarket shelf than the milk itself.

Project partners based in Sardinia at the Istituto Zootecnico e Caseario per la Sardegna (IZCS) investigated the processing methods that best preserve the CLAs in milk. Two traditional Italian cheeses were under scrutiny: Pecorino Sardo, a sheep's cheese from Sardinia itself, and Ricotta. The trials measured the fatty acid content including the CLA rumenic acid and its precursor vaccenic acid, oleic and linoleic acids.

The tests all centred on variables involved in the cheese making process. Cheese making involves enzyme treatment. Rennet is a naturally occurring enzyme in the stomach of young mammals and the type of rennet used to denature and coagulate the milk protein was varied. Also tested were different fungal lipases that are used to develop flavours in cheeses.

Cheese making is a complex process and other factors varied included homogenisation of cream, the use of freeze-dried whey as opposed to natural whey and ripening time. Overall, the only factor that affected the CLA composition of the cheeses was ripening time. The scientists found that there was a ripening effect over the period spanning 1 to 180 days.

Good news for manufacturers came when testing cheese made with bovine milk enriched with sunflower and linseed oils for increased CLA content. Quality in terms of sensory properties and composition were unaffected, which means that fortified milk can be used to gain that nutritional advantage.

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 > 4277

Protecting sheep from small ruminant lentiviruses

The search is on to find a vaccine for small ruminant lentiviruses (SRLVs), which affect sheep and goats. Researchers have now evaluated DNA vaccine strategies in sheep challenged with maedi-visna virus (MVV).

SRLVs are endemic in the EU. They are responsible for significant economic losses as a result of premature culling, smaller milk yields and a reduction in the number of offspring being born. They also cause a reduction in the weight of lambs and kids and poorer quality meat.

At present, SRLV infection is managed through diagnosis and culling, which is expensive, while many countries have no control policies in place. The virus is characterised by a slow incubation period, which means the economic impact, although

serious, is not immediately apparent. It may take a number of years before the true cost is realised.

The MVAC project studied whether new vaccination techniques could provide another area of control measures. The most suitable antigens for achieving protection and the best vaccination strategies were investigated.

continued on page 11

Placenta transfers pesticides to foetus

The incidence of allergic diseases like asthma has increased over the past few decades. As part of the drive to find the reason for this, scientists have investigated the transfer of environmental chemicals across the placenta to the foetus.

Xenobiotics are chemicals that are found in organisms but their source is external as they are not produced there. One common group of xenobiotic is the organochlorines. In industry, they have a very broad range of uses including solvents and insecticides. If biologically active, they can be toxic.

One notable example is dichloro-diphenyl-trichloroethane (DDT). As an insecticide, it was proved to be responsible for population reduction of animals like birds of prey due to egg-shell thinning. The EU-funded project Plutocracy has accumulated data on a more insidious effect of xenobiotics — that is, the predisposition to allergic diseases.

The research centred on the premise that exposure to xenobiotics during pregnancy may cause intrauterine sensitisation. This may then result in the development of the

allergy on further exposure to the allergen after birth. The project team at the University of Bristol studied the first steps of the process in the exposure of the foetus, transfer across the placenta and then accumulation in tissues.

To do this, they used an ex vivo placenta model that was perfused (bathed in fluid with necessary nutrients). They measured the radioactively traceable xenobiotics in the maternal and foetal circulation as well as chemical accumulation in the placental tissue and foetal organs. The organochlorines studied included DDT and dichlorobenzene (DCB), another insecticide. Polychlorinated biphenyls (PCBs), used in floor finishes and adhesives, were also monitored.

The scientists found that all the xenobiotics crossed the placenta to the foetus by the

process of passive diffusion although DCB diffused more rapidly. In key foetal organs, the concentration of some of the pesticides was higher than that of equivalent maternal tissues. These included blood, spleen, bone marrow, brain and liver.

The implications of this research are far-reaching as organochlorine accumulation in foetal tissue could impact on the development of nervous and immune systems. This could then result in postnatal health problems.

Further data combined with that accumulated from this research can be used in a multidisciplinary approach. This could include mathematical and pharmacokinetic modelling.

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 > 4240

Factors affecting the development of childhood allergies

Increasing environmental pollution may be connected to a rise in allergic diseases (ADs) throughout Europe. A study was carried out to investigate the link between a mother's exposure to pollutants during pregnancy and AD in children.

The prevalence of ADs appears to have increased in children over the last 20 years, especially in the developed world. A child faces the greatest risk of developing an AD during infancy. Therefore, it is of great importance to identify antenatal and early-life predictors for ADs at this time.

Recent studies showed that raised levels of the antibody immunoglobulin E (IgE) in cord blood (CB) provide an effective early marker for AD amongst children. Following a baby's birth, its umbilical cord is cut. However, some blood remains in the part which remains attached to the baby. This cord blood contains all the normal elements

of blood: red blood cells, white blood cells, platelets and plasma and proteins.

The Plutocracy project aimed to ascertain if there was a link between the level of CB IgE, the mother's AD status, and maternal exposures prior to the child's birth. Researchers interviewed expectant mothers from Belgium, Romania and Slovakia while in maternity hospital. The women's doctors completed a questionnaire regarding their patients' health. Both cord blood and blood from the mother were studied for IgE levels and other markers.

Statistical analysis did not show a link between maternal AD and raised levels of CB

IgE. However, the study did reveal a connection between living in a rural area or the presence of smokers at home, and elevated CB IgE. This information was used to develop prevention programmes such as encouraging pregnant women and members of their household to refrain from smoking.

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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continued from page 10 'Protecting sheep from small ruminant lentiviruses'

Researchers evaluated DNA strategies in sheep infected with MVV, which causes encephalitis and chronic pneumonitis. Genes for encoding MVV EV1 p55gag precursor and gp160 env precursor were cloned. They were then bound to a live attenuated adenovirus, which expressed the recombinant proteins. Additionally, the genes for encoding p55gag precursor were cloned and bound to modified vac-

cinia Ankara (MVA), a live virus that had been attenuated.

The adenoviruses used for encoding p55gag and another envelope protein (gp150 env) were found to be unstable, requiring further work to make them viable. The MVA live virus vector, however, was found to function correctly. It was used as an immunogen for prompting the generation of

antibodies. The data accumulated in this study can be used in the development of improved vaccine strategies for controlling SRLV infections.

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 > 4400

Wood dust links with sino-nasal cancer

Even prior to mechanisation and the production of vast amounts of fine airborne wood dust, adverse effects of contact with wood were well documented. New studies have investigated the molecular basis behind these deleterious effects.

The adverse effects of exposure to fine wood dust include respiratory allergic symptoms, mucosal and non-allergic respiratory symptoms, and cancer. However, the extent of these hazards and the particular wood responsible has not been clearly established. The EU-funded Wood-risk project therefore set out to collate up-to-date data on occupational exposure to wood dust. In particular, they investigated if there was any link between exposure and changes in genotype of cells in sino-nasal cancers (SNCs).

Project partners at the National Institute of Occupational Health in Copenhagen researched into a possible genetic basis for the effects of exposure to wood dust. Their first line of research was to study lung epithelial cells in vitro after exposure to seven types of wood dust, including that obtained from both soft and hard woods.

Potentially genotoxic effects were observed in four of the seven woods in the form of DNA strand breaks before inflammation reached its peak. An immune response was observed with all seven types of wood as production of cytokines.

The same team also followed a line of research in SNCs. Previous studies had shown that the highest risk of cancer was evident in cells of glands (adenocarcinomas) from exposure to hardwoods. In particular, they looked for specific mutations in a certain oncogene, KRAS that had previously been observed in SNCs.

The scientists looked at a collection of around 300 SNC tumours including adenocarcinomas. They looked for mutations in genes involved in cell division. KRAS produces a protein K-Ras that regulates cell

proliferation. Another, p53 is also known as the genome guardian, with good reason. It prevents cells from growing in an uncontrolled way.

They found that the incidence of mutations in KRAS was low. However, mutations in the tumour suppressor gene p53 were much more abundant — at variance with previous studies.

Data from this research will provide a good basis for further analysis to unravel the effects of wood dust on molecular mechanisms, particularly genotoxic effects. Knowledge of concentration effects can be used to set tolerance limits to improve safety for the work force involved in wood and its products.

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 > 4261

Estimating workers' exposure to inhalable wood dust

An investigation was undertaken into occupational exposure to wood dust within EU Member States. The information was used to improve health and safety in the workplace.

Researchers from the Wood-risk project estimated occupational exposure to the inhalation of wood dust in 25 EU Member States. Statistics for national labour forces, country questionnaires, exposure measurements and the judgements of experts were used to draw up a preliminary estimate. This was done according to the type of industry and the level of exposure which workers were subjected to. Results for all Member States were analysed and reviewed.

The aim of the study was to provide accurate and up-to-date data on occupational

exposure to wood dust. This was calculated according to country, industry and the type of wood dust inhaled. The study was undertaken for the purposes of hazard control and exposure surveillance, thereby allowing health risks to be assessed.

Wood-risk compiled data which was used to create improved conditions for the millions of people who are exposed to wood dust in the workplace. Information collected in 2000–03 showed that 1.2 million construction workers were exposed to wood dust, which in many cases was at relatively high

concentrations. The country with the greatest number of exposed workers was Germany with 700 000. The construction sector and furniture industry recorded the highest exposure levels, where 560 000 workers could be exposed to levels exceeding 5 mg/m³. The results have helped to raise awareness of the health effects associated with wood dust exposure.

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 > 4280

Plasma sterilisation of tissue engineering scaffolds

Human tissue can grow with the aid of polymer scaffolds that dissolve after tissue implantation. A novel plasma procedure sterilises the scaffold causing minimal destruction.

A number of medical procedures, especially bone substitution surgeries, could be greatly facilitated from the 'Tissue reactor' project. Project partners have successfully engineered connective tissue in vitro

and especially bone tissue and bone tissue constructs. On a polymer scaffold, tissue cells start growing. If the scaffold is three-dimensional, a three-dimensional tissue is produced — as required for bones.

Before the beginning of tissue growth, the scaffold of course must be meticulously sterilised. Sterilisation methods usually involve irradiation of the sample under consideration with gamma radiation. Gamma rays consist of high-energy photons, capable of not only sterilising the sample, the polymer scaffold, but also of actually damaging it. Illumination of the scaffold with gamma light results in a sterilised scaffold, but it degrades much faster and its mechanical strength is

continued on page 13

Unexpected health benefits of starch

Starch is an important energy source of the diet. Scientists have researched into other previously unknown benefits of this carbohydrate.

Starch is broken down into glucose in the mouth and small intestine. To date, the focus on its metabolic activity has largely been restricted to the glycaemic response and consequent glycaemic index. However, this is only a reflection of the influx rate of exogenous glucose, glucose produced in the liver and its distribution in tissues. Accordingly, scientists from the EU-funded project 13C-Starch investigated other important features of carbohydrate metabolism involved such as digestion time, internal transit time and gastric emptying.

The fate of glucose not absorbed by the small intestine is that it enters the colon and undergoes fermentation. The products include short chain fatty acids (SCFAs). Some of these enter the portal circulatory system and they then pass into the liver where they are thought to influence the organ's metabolism. Furthermore, they may be ligands (binding signalling) for protein receptors that are expressed in adipose or fatty tissue. Interest-

ingly, these have a wide range of effects like feeding behaviour and insulin sensitivity.

Partners at the University Medical Centre, Groningen, conducted research into glucose kinetics after a meal. The first step was to grow wheat and barley using a ^{13}C carbon dioxide source and then prepare food like bread using the cereals that had sufficient ^{13}C . The dual isotope technique was used so D-[6,6- $^2\text{H}_2$] glucose was also administered. During the period after the meal, the team were able to measure glucose concentrations in test subjects and determine its source, exogenous or endogenous. They could then obtain the net rate of intestinal absorption of glucose. Other ^{13}C products produced for tracking starch metabolism included ^{13}C barley for acetate production and ^{13}C lactulose, which is an important substrate for colonic fermentation.

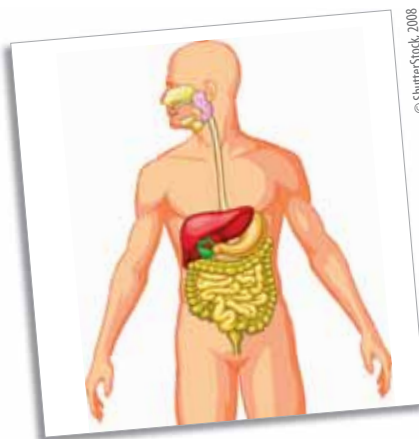
The ability to grow ^{13}C -enriched crops for traceable food in vivo offers a huge opportu-

nity to study the effects of starch fermentation and its metabolic effects in other tissues and organs. As such, it may provide further insight into obesity, type II diabetes and cardiovascular disease. For the food industry in particular, this provides evidence of advantages of the production of food that incorporates modified, slowly digestible and resistant starch.

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 > 4263



Ageing and motor control

Impairments in neuromuscular and skeletal function threaten the independence of elderly individuals. Scientists in the EU project Better-ageing have studied the part played by the ageing nervous system in musculoskeletal deterioration.

Frailty is the enemy of self-sufficiency of the elderly. Falling, loss of balance, and reduction in muscular stamina all contribute to loss of activity and ironically, can promote fear of taking recommended exercise.

The Better-ageing project aimed to investigate the sources of musculoskeletal deterioration and therefore enable recommendations for remedial action to stem the progress of the decline. Furthermore, it promoted the formation of joint initiatives between academic and social partners to help to realise these aims.

Project partners at the Université Libre in Brussels specifically researched the decline

of motor control in the elderly. Motor control depends on the proper functioning of the skeleton, joints and the controlling nervous system. The motor system is involved in the stimulation of muscle activity and is reliant on stimulation from the sensory system.

The scientists found that there is a considerable amount of remodelling in the motor nervous system when an individual ages. For example, there is a loss of motor neurons with age but there appears to be an increase in force for each motor unit. The scientists concluded that the observed decrease in muscle force may in part be due to a slowing of spinal reflexes and supraspinal

reflexes above the vertebral column. This would infer that the decline of the sensory system is more acute with age than that of the motor system and may be the culprit that causes frailty.

Data of this nature can be utilised to devise rehabilitation and exercise programmes tailored to improving the physical capacity and strength in the elderly. Information from the project has been disseminated to the inevitably large range of parties with a professional interest in successful ageing. This includes clinicians, physiotherapists, local practitioners, age related charities and voluntary organisations working with the elderly.

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 > 3720

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compromised. For in vivo applications, rates of degradation and mechanical strength are of crucial importance.

Another widespread substance used for sterilisation is ethylene oxide, a colourless flammable gas that effectively kills bacteria and fungi. Using this epoxide, 'Tissue reactor' project partners found that it caused less damage to the polymer scaffolds. The ethylene oxide sterilised scaffolds exhib-

ited slower rates of loss of their mechanical strength. However, some of the scaffolds' key degradable polymers were still damaged and overall scaffold performance was compromised.

Sterilisation using plasma, a highly ionised gas, finally provided the project partners with the solution. The plasma afterglow effectively sterilised the polymer sample and caused no noticeable thermal damage.

The method can be used to sterilise any porous polymer construct or composite and therefore its field of application will not be restricted solely to medical purposes.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4239

Sulphur transport increases plant nutrient production

Crops like maize and potato are high-yielding, but their amino acid content can be low, reducing their nutrient supply potential. European researchers within the OPTI-2 project have bred new lines that can absorb extra sulphur, required for methionine production.

Methionine is an essential amino acid. As such, it cannot be synthesised in animal cells and it must be supplied exogenously. Along with another essential amino acid cysteine, plant-based synthesis of methio-

nine requires sulphur, usually in the form of sulphate. Unfortunately for breeders, plants have regulatory systems to reduce uptake of sulphate when methionine supply within the plant reaches adequate levels.



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On this basis, a team of scientists at Rothamstead Research Centre in the United Kingdom aimed to increase the production of methionine in crops by manipulating the expression and transport systems associated with sulphur. Without the constraints of feedback mechanisms evolved to optimise metabolism, plants can be used as 'bio-factories' with much higher production potential.

The first step was to clone two high-affinity

sulphur transport genes, one from maize and one from potato. The expression of these in respect to sulphur metabolism could then be studied. As expected, transcriptional repression was observed when sulphur is in high supply. In order to counter this, two promoter genes were successfully used to avoid these control mechanisms. Action of the genes was confirmed using the reverse transcription polymerase chain reaction (RT-PCR).

Transcribing genes is only one way of increasing the concentration of a product. Another means is to create special sinks for the nutrient so that transcription may continue uncontrolled. Double transformants, plants containing the transporter gene and a zein sulphur-rich protein (the sink), were therefore engineered. This acted to further increase the uptake of sulphur at the roots.

Plants form the natural production base for all food chains. Using these new plant lines, further research can help to enhance the natural ability of plants as manufacturers. Manipulation of the control systems in everyday crops holds a promising source of nutrient rich food supply for animals and the human diet.

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 > 4381

Probiotics stop Salmonella in its tracks

There is evidence to suggest that probiotics offer health benefits. Scientists have gathered experimental proof that certain strains of Lactobacillus and Bifidobacterium can act against salmonellosis.

Probiotics are dietary supplements that contain potentially beneficial bacteria or yeasts. Pharmacies and health food shops stock a range of these that can improve microbial gut flora and help prevent microbial imbalances. Partners working under the umbrella of the EU-funded project Propath aimed to characterise the mode of action of some probiotics.

They investigated the action of probiotic bacteria, lactobacilli and bifidobacteria against Salmonella in vitro and in vivo. The scientists used a certain strain of *Salmonella enterica Typhimurium* that has the ability to move, in common with the rest of that species of bacteria. They found that the inhibitory action of the two groups of bacteria were very different.

Formation of organic acids like ethanoic and lactic acid by bifidobacteria was the sole reason for their ability to prevent the action of salmonella. When the nutrient

source was varied, beneficial changes were brought about for metabolism and growth. Moreover, *Bifidobacterium longum* had a positive effect on the growth of some lactobacillus strains.

Different strains of lactobacilli by contrast used different defence mechanisms. Using large-scale fermentation studies, the team was able to characterise these. Some produce non-protein anti-Salmonella compounds that are active at low pH and are heat stable, unlike proteins. Specifically, three strains under observation were found to prevent the invasion by Salmonella of cell culture lines like those lining the enteron. Others changed the motility of the bacterium, which was its very key to success in causing salmonellosis.

In vivo studies also yielded promising results. After administration of two strains of lactobacilli, there was found to

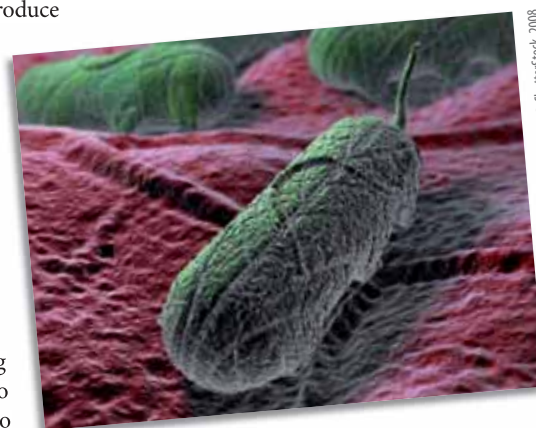
be a reduction in the population of Salmonella in the gastrointestinal tract and tissues.

The data compiled in this project is good news for food companies. In particular, it provides a basis for further research into symbiotic relationships between bacteria and interactions between pro and prebiotics, their nutritional source.

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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Palladium membranes to optimise hydrogen production

The University of Warwick in the United Kingdom exploited hydrogen's (H_2) attraction to palladium to develop a novel membrane that facilitates the production of pure H_2 gas.

In the race to cut emissions of greenhouse gases, H_2 -powered fuel cells are expected to make a significant contribution. One of the main challenges, however, is to produce H_2 from renewable energy sources in a cost-effective manner. The EESD programme led the way by funding research to increase process efficiencies and lower costs.

Superhydrogen, a project targeting the production of H_2 from biomass and waste using supercritical water gasification, is an example of this effort. The University of Warwick, a member of the Superhydrogen consortium, experimented with catalytic membranes made from palladium.

Using advanced techniques, the British engineers managed to deposit an extremely thin, uniform layer of palladium on a porous ceramic substrate. Remarkably, they were able to achieve thicknesses in the order of just 3–10 microns without rupturing the membrane.

Laboratory tests of the prototype indicated excellent performance characteristics with respect to H_2 production rates and purities. The economics of the technology also proved attractive. The final hurdle prior to proceeding with commercialisation entails demonstrating the reliability of the membrane production process.



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 > 4294

SiC for high-temperature electronics

The emergence of silicon carbide (SiC)-based power semiconductor devices has resulted in a substantial improvement in the performance of high-voltage power electronics applications. Pioneering research by the ATHIS project has established their superior features compared with silicon (Si)-based devices.

Significant advances in Si-based high-temperature electronics had a considerable impact on many key industrial sectors. In the oil and gas sector it has been increasingly important in prolonging the life of hydrocarbon reservoirs by increasing extraction efficiencies, thus lowering the cost per barrel of oil. In the aerospace and automotive sectors, the main technology driver has been the move towards higher power and higher temperature operation.

However, Si-based power devices are not able to meet the continuous demand for higher current and voltage blocking capacity, and moreover even higher tempera-

ture. Within the ATHIS project, SiC has been identified as a material with the potential to replace Si due to its superior electrical and thermal properties. Project partners at the Centro Nacional de Microelectrónica in Spain experimentally evaluated the performance of the most advanced SiC power devices, SiC-based Schottky diodes.

SiC-based Schottky diodes exhibit high thermal conductivity and high critical breakdown field strength. These SiC power electronic devices should therefore be able to operate in extreme environments and under a wide range of operating tem-

peratures. Taking commercially available Schottky diodes one step further, titanium (Ti) widely used for rectifying contacts on Schottky diodes and reducing power dissipation was replaced by nickel (Ni).

Current state-of-the-art silicon p-n junction diodes were electrically tested and characterised as a function of temperature. Comparisons with the results of the same tests performed with the improved Schottky diodes revealed prestigious qualities of being more than compact and lighter. With low switching losses, they proved to be ideal for high-voltage electronics applications, such as power electronics converters.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4276

See also page 47 (offer 4145)

Evaluation matrix for renewable energy technology

The EU leather industry is well suited to the application of renewable energy systems (RES) technology. A decision matrix was used to determine which particular type of technology was best suited to the sector.

Tannery sites produce more waste material than leather products. A great deal of energy is disposed of within this waste material, which is referred to as biomass. In fact, more energy is disposed of this way than is used in manufacturing leather products. The MOND project has investigated the best technologies for reducing operational costs by using this energy in a sustainable way.

Quantifiable criteria were used to select those technologies which were best suited to the leather industry. This involved the use

of numerical assessment, based upon a decision matrix. Standards, like emissions/tonne processed, were scored on a scale of 1 to 10 for each of the four main criteria which were economy, energy efficiency, logistics and safety. The results were put into the matrix format. Each of the factors assessed had to pass a minimum threshold. Failure to achieve a minimum score for any of the criteria meant the process was not taken any further. Therefore, only those technologies that satisfied all requirements were recommended for implementation. However,

the matrix did take into consideration the developmental progress of a technology and any anticipated benefits from it.

Once the different technologies had been selected, they were ranked according to their applicability to the leather industry. Each technology was given a grade, which ranged from best to worst. This information was also used to match suitable technologies with particular applications within the industry according to geographical area, the requirements of legislation and specific national demands.

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 > 4292

In search of a geological repository for radioactive waste

The reaction of clay, one of the materials proposed for use as a geological barrier in radioactive waste management, to differences in temperature was investigated by nuclear experts with the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH in Germany.

Increasing attention has focused on nuclear power as a carbon-free source of energy. However, nuclear energy has its own environmental challenges, one of which is safe disposal of the spent fuel. Before a geological repository can be constructed, the behaviour of the surrounding rock must be fully understood.

The Fifth Framework Programme (FP5) funded research in this field, including the HE project, which examined the effect of heat on the properties of Opalinous clay and crushed bentonite.

Emissions of carbon dioxide (CO₂), hydrocarbons, hydrogen, oxygen and other species were measured under normal conditions as well as at the HE heating tube installation. Other parameters, such as temperature, humidity and pore pressure were also monitored.

Analysis of the dataset was led by GRS, a member of the HE research consortium. At temperatures normally associated with mines, in the order of 14 °C, oxidation of hydrocarbons consumed oxygen and contributed to

increased CO₂ emissions. Decay of uranium contained within the clay also led to the discharge of small amounts of helium. GRS concluded that variability observed between measurement sites could primarily be attributed to inhomogeneities in the Opalinous clay.

In the laboratory setting, at temperatures approaching 100 °C, gaseous emissions were dominated by CO₂ and, to a lesser extent, hydrocarbons. In the field, where temperatures reached a peak of approximately 50 °C, no major changes in rock properties were perceived over a period of 18 months. However, GRS and its HE partners stress that this result cannot be extended to higher temperatures without further field experiments.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4300

Inexpensive, sustainable production of bioethanol

TMO Renewables Ltd in the United Kingdom has discovered tiny organisms that could be the key to unlocking the full potential of bioethanol in Europe and beyond.

Biofuels may not be the panacea once thought, but if sustainable production methods can be achieved then petrol's days could be numbered. For instance, ethanol, a popular fuel traditionally produced from sugar cane and other food-related crops, can also be produced by fermenting lignocellulosic biomass sourced from wood residue and other waste products.

Unfortunately, until now, ethanol production from lignocellulosic biomass has not been competitive in terms of costs. The 'Co-production

biofuels' consortium aimed to overcome this obstacle by optimising fermentation technology.

TMO sought to maximise rates of ethanol production and focused on the potential of high-temperature ethanologenic micro-organisms. They discovered that lactate dehydrogenase deficient (LDH) strains, which are unable to generate lactate, performed best. Surprisingly, TMO found that the micro-organisms could be cultured for extended periods (up to six months) without requiring antibiotic intervention.

The LDH micro-organism was put to the test during the project, using wheat straw hydrolysate as a feedstock. The trial was successful for both batch and continuous modes of fermentation. The full results of the EESD-sponsored research are available from TMO.

Future work will focus on ethanologensis from simple sugars, such as glucose and xylose. Thanks to TMO and its partners, the outlook for bioethanol looks brighter than ever.

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

Collaboration sought: licence agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4293

Alternative fuel injection boosts diesel engines

The search for alternative fuel, especially those produced from natural substances such as gas or biomass, has lead research to investigate dimethylether (DME) as a suitable replacement for carbon-based fuels. Funded by the EU, the Afforhd project developed a fuel injection system for DME fuels.

DME is also known as methoxymethane, oxybismethane, methyl ether and wood ether. Its importance to fuel-based economies lies in the fact that it can be produced from a number of natural resources, namely natural gas, biomass, methanol and even coal in the more advanced plants.

Whilst international interest for developing DME production methods is high, the Afforhd project looked more to its actual use, developing a fuel injection engine to maximise DME use. The diesel engine is a heavy-duty one, based on the low-pressure, common rail design and is comprised of a

high-pressure pump, rail and injectors as well as the necessary components required.

The system works on precision. Extensive durability tests have been conducted, proving that the system meets the project objectives of developing an engine with an excellent combustion ratio and practically no emission levels.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4343

What is a technology offer?

All research results uploaded on the Technology Marketplace are assessed by CORDIS to reveal their exploitation potential. The top ones are selected and rewritten as technology offers in a journalistic style. Online, each offer is linked to the related result.

Tempted by a technology presented in this issue?

All of the projects presented in the supplement are seeking cooperation partners in specific areas, and interest in their work is welcomed. Please contact their coordinators directly if you would like to know more about them.

Efficient solar cell energy production

Current unforeseeable high oil prices have revived interest in alternative and cleaner forms of energy production. Industrial fabrication of highly efficient solar cells would increase solar energy consumption.

It is a well known fact that natural resources are limited. In addition, high growth rates of the developing countries resulted in a sharp increase in global oil consumption. Moreover, a number of environmental hazards result from constantly rising energy consumption. Among the so-called alternative forms of energy, solar energy is an ideal source. With the aid of silicon solar cells, solar energy is gathered and consequently converted to electricity.

At laboratory scale, highly efficient silicon solar cells can be fabricated. The INDHI project has developed the corresponding industrial processes for massive solar cell production. Better

solar cells, industrially fabricated, will substantially increase the use of solar energy.

The selective emitter is the backbone of any solar cell. It is the quality of this selective emitter that basically determines solar cells' efficiency. The INDHI project partners have successfully developed a novel screen-printed selective emitter for industrial multicrystalline silicon solar cells. The emitter has been fabricated with selective printing on the substrate material of doped pastes.

INDHI project partners used the commercially available Soltech P101 thick film

dopant paste for the formation of the emitter. Several selective emitters have been obtained with resistance values ranging from 20 to 100 Ohms per square centimetre (Ω/cm^2) of the emitter's sheet.

The selective emitters formed in this work package of the INDHI project have been extensively optimised and tested. Control of the lateral diffusion of the doped paste, reflectance and characterisation of the properties of the junctions have been among the optimisation parameters. Efficiencies approaching 20 % have been achieved.

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 > 4205

Optimising energy output from silicon solar cells

Engineers with the Technion-Israel Institute of Technology (TIIT) have learned how to coax even more energy production out of multicrystalline silicon solar cells by etching their surfaces.

The EU has set ambitious goals for power production from solar energy. Current technical and financial obstacles must be overcome in order to succeed. The EESD programme has funded research to improve the efficiency of solar technology, such as the Fantasi project addressing multicrystalline silicon (mc-Si) solar cells.

The TIIT, a partner in the Fantasi consortium, took on the task of optimising an etching technique called 'Negative poten-

tial dissolution' (NPD). Texturing the mc-Si surface improves its performance, but until now has been a costly procedure.

The Israeli material scientists began working with monocrystalline silicon and then extended the results to polysilicon as well as edge-defined film-fed growth (EFG) silicon. Their experimental campaign revealed that a negative potential of -20 V or lower must be maintained. In addition, they identified a maximum rate of silicon removal

when the alkaline concentration of the solution was kept between 20 and 24 %.

The NPD process was manipulated to produce both isotropic and anisotropic texturing. Finally, time is a critical parameter and TIIT was able to deliver high-quality results in under 60 seconds.

Future efforts of TIIT and its Fantasi partners will focus on expanding the application of NPD technology and enlarging the texturing surface area.

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 > 4252

Software agents optimise distributed power generation

Electronic commerce has revolutionised the way business is done worldwide. The organisations participating in the CRISP project investigated the possibility of extending this transformation to the energy market.

The Energy Research Centre of the Netherlands (ECN) coordinated the CRISP project, which received funding of over EUR 1.5 million from FP5. The goal was to bring the benefits of information and communications technologies (ICT) to distributed energy production.

The ECN identified agent-based software solutions as highly applicable to a market driven by multiple energy sellers and consumers. The algorithms necessary for the implementation of an agent-based system were subsequently developed. Its autonomous agents are capable of communicating with one another and carrying out transactions.

A library was constructed to host information about the various types of agents created during CRISP. The agents were then used in scenarios defined by ECN and its partners in order to assess their performance. They demonstrated the ability to optimise tasks such as matching supply and demand and intelligent load shedding.

Looking to the future, ECN is confident that its agent-based solution can signifi-

cantly improve the technical and financial attractiveness of an electricity network dominated by distributed power generation.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4018



Preparing for a storm

An examination of the potential risks that may occur due to the impact of the water following a storm has been examined in a study put together by researchers at the University of Denmark. It presents tools which can be applied to such an assessment.

When a storm occurs, the water that gathers can cause irreparable damage to the surrounding areas. In an urban environment this can cause havoc not only for residents but damage buildings and endanger safety. The white paper presented as part of the Daywater project examines the risks relating to storm water effects on cities.

Among other achievements, the paper emphasises the importance of public perception of what constitutes a risk. It states that an individual's perception of the same risk varies a lot. After looking at definitions, the paper turns to explore risk management itself. It presents a framework for risk analysis. A draft outline of the tool for screening potential storm water pollutants is presented. These tools will have potential applications both within hazard and vulnerability identification and assessment.

The paper also addresses the subject of uncertainty in risk management. It constructs a matrix for analysing uncertainty when



making decisions relating to urban storm water management. The paper demonstrates that decisions can be divided into four different regimes. These are based on differences of opinion of what the goal may be and on knowledge available regarding the technology needed to achieve the goal.

Finally, results of questionnaires are presented that have been conducted as part of the project. A matrix was drawn up, which divides the urban storm water system into seven different risk objects and seven different types of risk.

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 > 4210

See also page 27 (offer 4299)

For timely assessment of landslide hazards

Early warning and civil protection could start with reliable analysis of deformation observations of the Earth's surface, followed by landslide risk assessment. The issue is to single out warning signals as early as possible to have more time for preventive action.

Landslides are among the most common secondary effects of earthquakes that cause huge damage to settlements and infrastructure, and often claim human lives. Although such natural hazards cannot be controlled, researchers are trying to develop effective and importantly, reliable alert systems based on a clearer understanding of processes triggering landslides.

More specifically, for the delineation of potential natural hazard sites, model calculations were compared with empirical observations from land deformation monitoring networks. A multidisciplinary observation concept was introduced by the OASYS project partners for this purpose. A network of global positioning system (GPS) stations was installed to identify active zones and refined by means

of high-precision remote sensing data (satellite data and aerial photographs).

The main contribution of remote sensing data was used to map factors, such as slope inclination, geological faults, vegetation and land use, which may relate to the occurrence of landslides. However, an alert system has to anticipate potential landslides as early and precise as possible. This means that not only the deformations in the Earth's surface have to be observed, but also deformation measurements have to be continuously logged and fed to a real-time alert system.

The GPS measurements were therefore used for large-scale monitoring of areas prone to landslides, while real-time measurements of

three-dimensional displacements were provided by the Georobot monitoring system. The Georobot monitoring system can be used for automatically identifying targets and collecting information on block movement and on the boundaries between stable and unstable areas. The automatic Georobot landslide monitoring system comprises a base station, reference points, target points, hardware and software. Real-time deformation measurements were transferred to the central station computers where innovative analysis tools were applied to assess the development of the sliding area.

All the information collected could be used within a knowledge-based or a fuzzy system to define the potential landslide risk. Finally, a clear decision should be possible to inform affected inhabitants whether an evacuation is necessary.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4236

Monitoring against another Pompeii

A WiMAX-based connection to the internet will enable real-time monitoring of potentially dangerous active volcanoes.

For effective monitoring of volcanic activity, scientists want to know what is happening in real time, not the pattern of events last week. For many remote volcanoes, that has just not been possible. Now a new system, intended to monitor activity around Mount Vesuvius in Italy and at volcanoes in Iceland, offers a major step forward in real-time communications.

In Iceland, scientists have been driving to their remote volcanic monitoring stations about once a week in order to download the data from the station hard disk and then returning to their laboratories to analyse it. The new monitoring system can deliver around 75 Mb/s of data remotely over a WiMAX wireless connection.

The WiMAX system offers a robust, high-quality connection. Transmitting rich data like this, it is very important not to lose any of it, suggests Enrico Argori, a leading researcher on the WEIRD project that developed the monitoring system. 'WiMAX is the cheapest channel [...] to do this, and it is the channel that can deliver the best quality of service.'

The monitoring system does not swamp the airwaves with useless data. Only when significant activity occurs will the monitoring system communicate data. And critical transmissions can be protected from interference. Bandwidth can be reserved using a protocol called Diameter, that identifies data traffic and prioritises information from the volcanic monitoring centre to ensure commu-

nications are not blocked by lower-priority data traffic, such as messaging.

Though far from being a new technology, the WEIRD research team has managed to extend WiMAX's resilience and flexibility.

The monitoring system includes a series of features that are important for the future integration of WiMAX with other wireless and telecommunications systems we use. The WEIRD team seamlessly integrated WiMAX with a range of other network technologies to enable high-quality, end-to-end communication, regardless of the route it takes.

WEIRD developed software that exploits the advantages of 'next-generation networks' (NGNs). NGNs layer information, decoupling the applications from the underlying transport stratum. Whatever the underlying network, the volcano monitoring signals will be relayed in full from end to end.

Not all applications are designed to run on next-generation networks. For these, the research team built a series of adaptors — known as WEIRD agents or WEIRD application programming interfaces — that allowed non-NGN applications to take advantage of the boosted quality of service and seamless mobility features of the wireless volcano-monitoring system.

WiMAX is being viewed more and more as a complementary, rather than competing tech-

nology to existing wireless communication access channels, such as WiFi and mobile telephony services. So, the successful seamless integration of WiMAX via 'media-independent handover' is an important step forward.

An important feature of WEIRD's monitoring system is not that it is technically possible but that it can be practically applied by non-communications specialists.

Software was developed that hides the complexity of the configuration of end-to-end communication channels, whatever the different equipment or different versions of WiMAX used. It means that a member of the monitoring team can quickly and easily establish an end-to-end communication path without specialist training, allowing them to concentrate on what is vitally important at the time — their monitoring job.

Bi-directionality was also tested in this setting, meaning that the volcano monitors can pan or zoom onto a potential trouble spot with the remote cameras, as well as receive signals from them.

'The main part of our work is to make it easy for end-users [to benefit] from new technologies like WiMAX,' explains another member of the WEIRD research team, Giuseppe Martufi.

WEIRD received funding from FP6.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89941>

See also page 8 (Putting a virtual doctor in the ambulance)

Saving the Eurasian otter from extinction

Wildlife frequently competes with mankind for the same natural resources, and almost always loses. The FRAP research consortium is looking to turn this situation around, in particular for the Eurasian otter.

The Eurasian otter (*Lutra lutra*) is an endangered species that is threatened by loss of habitat as well as water pollution. In many

regions across Europe the otter also comes into conflict with fish farming, which shares the same ponds and streams.



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A unique RTD project funded by the EESD programme sought to develop a 'Reconciliation action plan' (RAP) to address the Eurasian otter's plight. The approach involved the assessment of all necessary socio-economic and ecological constraints, and required the active participation of all the stakeholders.

The Institut für Wildbiologie und Jagdwirtschaft (IWJ) in Austria, a member of the FRAP research consortium, took the lead on the RAP for the Eurasian otter. They focused on their own territory, as well as that of the Czech Republic, where aquaculture is a thriving industry.

The resulting RAP is designed to be used as a decision support tool by local and regional authorities. The aim is to facilitate efforts to protect the Eurasian otter while enabling peaceful coexistence with fish farming. The FRAP methodology will also be applied to other vertebrate species affected by the fishing industry.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4380


European and Indian researchers are applying principles learned from living organisms to design self-organising networks of wireless sensors suitable for a wide range of environmental monitoring purposes.

One answer is to use a wireless sensor network to monitor geological conditions. Wireless sensors are becoming popular because the sensor nodes are small, simple and cheap and require no cabling to connect them together and to the control centre. They can be used for numerous purposes and are well suited to environmental monitoring.

However, what matters is not so much the reliability of the individual sensors but the reliability of the network as a whole. Does this system reliably monitor air pollution in the city centre? Does that system reliability measure weather conditions on the motorway bridge?

What makes Winsoc different from earlier projects is that it has taken its cue from biological systems. Where sensor networks are made up of many individual sensors, living organisms are made up from many individual cells.

against cells dying or being damaged,' says



A photograph showing a steep, rocky hillside with patches of snow, indicating a landslide area. In the foreground, a black sign with a blue border and yellow text reads "LANDSLIDE AREA". The sign also features a green arrow pointing left and the text "SUPPORTED BY MRC" and "KING-ACAP". The background shows a mountain range under a blue sky with clouds.

© Shutterstock, 2008

A striking example is the rhythm of the heart, which is controlled by the interaction of several pacemaker cells, each of which can be seen as a pulse oscillator. Even though individual oscillators are not particularly stable or reliable, the heart as a whole is extremely stable and can readily adapt to changing conditions.

A prototype sensor node is being developed, but the challenge is to make the network able to continue to function even when several sensors fail.

This biological principle is being tested in the landslide detection system. A prototype network of geological sensors has been installed in the Idduki rainforest of Kerala, a region vulnerable to landslides in the monsoon season.



In a second demonstration, the team has implemented a computer simulator that emulates the spread of a fire through a forest. The simulator also mimics a sensor network designed to monitor and alert of forest fires. Sensors have been placed in a forest in the Czech Republic to detect and locate sources of heat and smoke.

The consortium is also developing a ‘Sensor Web’ to allow applications and services to access sensors of all types over the internet. This is a distributed sensing system in which information is globally shared and used by all networked platforms.

In the long term, the group expects two kinds of benefits to emerge from the project. 'The first is related to the monitoring of the Earth with a system capable of autonomous decisions,' says Barbarossa. 'This is particularly important in remote areas where it is difficult to recharge batteries or replace defective nodes.'

A second major goal is progress in the design of self-organising systems. 'We believe that cross-fertilisation of ideas from biology to engineering and vice versa can provide substantial benefits to both areas.'

Winsoc is funded by FP6 and is due to finish in February 2009.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89979>

Latin America water management puzzle gets missing piece

Citizens and representatives must be pulled into the negotiation process if water management and combating pollution are to succeed in densely populated regions of Latin America. Role playing in a real-life negotiation game shows this new research being pioneered with EU support in Brazil.

Keeping supplies of safe water plentiful is one of the most important yet basic achievements for the development process. Particularly in urban areas, the issue of water management is a complicated one, which involves sorting out competing interests regarding the surrounding land use.

The research, conducted by researchers based in São Paulo as part of this EU-financed project Negowat, aimed to preserve the quality of water in the Guarapinga reservoir in Brazil. The catchment area of the reservoir has between 300 000 and 800 000 inhabitants

who have an influence on the quality of water in the reservoir. This water quality, in turn, affects the water quality of supply systems providing between 5 and 10 million people.

This research has been set up in cooperation with the EU to facilitate lasting solutions to this issue, by providing stakeholders involved with training on negotiation skills. Through the process of role playing in a game situation, urban residents and representatives were encouraged to engage with the negotiation process as it would relate to local planning in the protected area. A

simplified companion modelling process was set up and replicated twice. First, in the municipality of Embu-Guaçu and second, in the three communities of the Parelheiros sub-municipalities.

Monitoring of the sessions showed that the methodological approach contributed to changes as concerned the representation of other actors and system functioning. It also improved participants' understanding about the dynamics of land and water management in these areas. Furthermore, it enabled a better relationship between local actors and public sector agencies, improved the capacity of representatives in negotiating and interactions with other organisations.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4271

Breaking the poverty — environmental damage cycle

An in-depth examination revealed the interrelationship between poverty and environmental degradation in Rosetta, Egypt.

Environmental degradation is the deterioration of the environment through the depletion of natural resources such as air, water and soil, the destruction of ecosystems and the extinction of wildlife. In fragile ecosystems such as coastal areas like the Mediterranean where the population relies heavily on the environment and natural resources for survival, the effects can be economically devastating. In short, this leads to poverty which essentially means that people are deprived of the physical, economic, human and societal fundamentals that establish the quality of life.

In light of this, the Medcore project conducted an in-depth examination of the interrelationship between poverty levels and environmental quality existing in the area of Rosetta. Particular focus was on the socioeconomic conditions and the inherent factors of poverty, with the goal of breaking the link between poverty and environmental degradation.

The process unfolded over various stages. The first stage consisted of an assessment of the poverty levels in the area in order to distinguish prevailing poverty levels across various

groups. Following this, environmental issues in each area were pinpointed and their connection to poverty levels were analysed.

The results revealed that although the poverty level in the Rosetta area is high, it is not linked to social and demographic factors. However, poverty was found to be linked to environmental conditions. This concludes that an extensive strategy is needed to incorporate the economic, social and environmental features in order to break this cycle.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4226

**See also page 28
(offers 4188 and 4266)**

New theory on old environmental platforms

Preserving the environment, instigating best practice methods for environmentally friendly technologies and enforcing them is complex since it is a global and not necessarily a regional affair. As such, new multi-platform management systems developed through the Negowat project consider all stakeholders and provide the basis for workable solutions.

As a matter of fact, biomass such as forests, rivers and lakes do not acknowledge regional borders and territorial sovereignty. However, environmental practices in one nation may conflict or undermine the environmental efforts of another. Solving such conflicts becomes a multifaceted problem, arising from such sources as technological, social, industrial and economic inequalities. Many multi-stakeholder platforms (MSPs) have fallen short simply because

they have been implemented in areas of such inequalities.

The Negowat project looked into developing an MSP with agent-based modelling role game playing. The study found that perceptions based on power asymmetries could hinder rather than promote effective cooperation.

Other platforms such as strategic actions offer viable alternatives, as they tend to con-

sider principles that MSPs do not — such as historical determination and difference of interest. Conducting studies on how to best blend MSPs and strategic actions based on power asymmetry might provide the necessary steps towards a collective understanding.

The Negowat project partners developed a course on their findings. The course is recognised by and taught at San Simon University, and based on the methodology and experience of the researchers.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4232

Ecological approach to seawater decontamination

An innovative, effective method of cleaning up polluted seawater has been discovered by DSM Deretil SA and its partners in the framework of the CADOX research and technological development project.

The contamination of water resources by hazardous materials is a serious environmental threat. Many of these substances are biorecalcitrant and thus not biodegradable via conventional methods. The EESD programme funded the CADOX project to address this challenge.

The research consortium looked to combine the benefits of ultraviolet radiation with those of the so-called Fenton process, which

relies on a mixture of hydrogen peroxide (H_2O_2) and iron ions (Fe^{2+}). The photo-Fenton process consists of compound parabolic collectors, which drive the photochemistry, and specific concentrations of the H_2O_2 and Fe^{2+} catalysts.

In order to maximise the extent of biodegradation, an aerobic immobilised biomass reactor (IBR) was incorporated into the system. Additional advantages of

the IBR include improved nitrification and denitrification.

During CADOX, the novel system was tested out on seawater artificially contaminated with methylphenylglycine, a common biorecalcitrant pollutant. The results were impressive, with approximately 90 % removal of the total organic carbon from the waste stream. In addition, an economic analysis indicates that the technology is competitive with respect to cost effectiveness.

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

Collaboration sought: joint venture agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4397

Remote supervision of processing plants

Sequential batch reactors (SBR) are two-phase processing plants that use an improved oxygen-based aeration phase that is followed by a decanter phase. The problem with aeration in treating wastewater sludge is that it needs to be carefully monitored and balanced if the process is to be maximised. An EU-funded project has examined a remote earthernet online interactive (EOLI) system to facilitate this process.

To test the EOLI supervision and control system, two plants were used: at INRA, France, and ENEA, Italy, in which the hardware and software being evaluated were installed. The purpose of the exercise was to evaluate the performance values under differing architectures to those developed in the project.

Additionally, testing was conducted both at laboratory and pilot scale levels to determine the effectiveness of the remote control centre. Because these plants require a series of high-grade sensors in order to feed the

process with data, the project had to develop the integrated EOLI supervision and control system at both low cost and in an efficient manner.

The success of the project can be determined by its potential to be integrated and its high level of standardisation. This means that the EOLI system can be applied to processing plants of different sizes using different sensor network configurations. The EOLI system is capable of dealing with these differences, being able to detect faults, abnormal working conditions and still operate

model-based controllers to ensure optimal performance.

As one of the most attractive features, however, the remote control system remains fully customisable. This was a key requirement of the project if the system was to appeal to all interested parties using a variety of different processes. This versatility ensures that modules can be used in the system to implement differing features and functions as desired. As a client/server-based technology based on a relational database management system, it allows for the sharing of the same resources which improves versatility, operability, usability and scalability.

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

Collaboration sought: marketing agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4270

Getting the best out of water purification processes

A new and improved control strategy used in the purification process of wastewater has been implemented. This concentrates on minimising the reaction time and on ensuring high purification performances.

Wastewater from urban settlements, especially in such urbanised areas where industries contribute heavily to water pollution, poses a significant health and safety risk to the public. The objective of this project was to contribute to the design of a low-cost, reliable monitoring system for the wastewater treatment process.

The technology behind such a system would involve integrating data collected by sensors which detect faulty or abnormal working conditions and then activate model-based

controllers. These optimise the technology and operation of sequential batch reactors.

As part of the EU-funded EOLI project, the scientists focused on a particular strategy within this operation. This strategy is concerned with the design and implementation of the sub-optimal controllers described as event-driven optimal control (ED-TOC). The strategy provides the tools to minimise the reaction time and ensures high purification performances. It also allows for an increase in the volume of wastewater that

can be treated within a specific time interval. This increase allows for the maintenance of good biological activities for the nutrient removal, as well as a good settling capacity for the sludge. This means that optimal separation of the purified water and the biomass occurs.

The control software used in this strategy was rewritten in order to account for these modifications. This software named Biorec, an acronym for bioreactor control, is now capable of integration. It can therefore be used in different hardware platforms and various high-level software configurations.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4229

Purifying water with the help of metal-based catalysts

Research by the Aquacat consortium has identified the optimal metal-based catalyst which will form the heart of a new solar-powered water purification system.

Access to safe drinking water is something most people take for granted, but a significant portion of the world's population cannot make this claim. Water purification is an energy-intensive process, so intelligent solutions must be sought to provide this service, especially to developing regions.

The Aquacat project received funding from the European Commission to produce a system using solar energy to decontaminate polluted water. Spanish scientists from

Ciemat working at the Plataforma Solar de Almería test facility investigated the efficiency of two light-activated catalysts: titanium dioxide (TiO_2) and a ruthenium complex, Ru(II).

Ru(II) was affixed to polymer strips and submersed in a reactor chamber filled with water artificially fouled with *Escherichia coli* (*E. coli*). Comparison with a blank sample, which was only exposed to light, indicated that the Ru(II) catalyst was able to rapidly

reduce the *E. coli* concentration by four orders of magnitude.

Similar tests with TiO_2 mounted on Ahlstrom (KN47) paper revealed slower rates of bacterial deactivation. In a final experiment, Ciemat combined the two catalysts in series to identify any possible synergistic effects, but unfortunately none were detected. Based on these results, the Ru(II) catalyst is recommended.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4225

See also page 24 (offer 4208)

Improved water quality models for temporary waters

The TEMPQSIM project improved the effectiveness of water management in the Mediterranean and semi-arid river catchments. The hydrological and water quality models developed reflected dry periods without runoff and first flush effects due to rain.

The upgraded models were tested in catchments within the Mediterranean region. Previous water quality models had been developed for permanent rivers and streams. However, such models did not accurately reflect those conditions found around the Mediterranean, where catchments contain a system of winterbournes.

Models were refined by respective users and communities during the course of the project. A coarse scale delivery model, a water quality model and a detailed biochemical model were developed and tested. The delivery model

showed that the amount of water entering Mediterranean catchments varied according to the season. The results of the model were scaled up to give an indication of the significance of winterbournes at the European level.

The water quality model concentrated on two main features, differentiating between the biochemical aspects of temporary and permanent waters. These included biological processes in pools, which continue even after surface water has stopped flowing, and the accumulation of organic particulate matter. The model indicated the potential

for material to accumulate to a significant degree within the channels during dry spells. The effects of the first flush of the system by following heavy rain were also recorded.

The biochemical model was used to investigate the effects of drying and rewetting in Mediterranean catchments. It was also used to analyse the resuspension of sediments during conditions of low flow, when significant changes occurred in nutrient concentrations. During flooding, the level of pollution varied according to the amount of water entering the system. The information gained from TEMPQSIM has helped with the drawing up of guidelines for operating models and in adapting current management strategies.

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 > 4222

Making decisions for urban water systems

Decisions made by administrators can have a major impact on the quality of people's lives. Good practice recommendations (GPRs) help to make the right choices regarding the water systems in urban environments.

The Watertime project developed an analytical framework containing data on 29 cities. This included information concerning those factors which have affected the decision-making process. A series of 44 GPRs was developed. The aim was to improve the quantity and quality of information available to all stakeholders.

The GPRs employed a number of different parameters. These included the different stages of the decision-making process, information pertaining to past events and possible threats in the future. The GPRs could be used as a separate set of recommen-

dations or as part of the decision support tool, the Watertime 'Participatory decision support system'. This was created to aid the public decision-making process regarding public water supply.

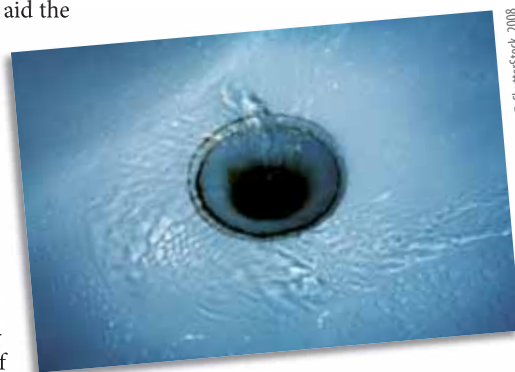
The intention of the Watertime model was to ensure a transparent process and the participation of the public. It allowed managers to develop their ideas through setting their own criteria and accessing the necessary information and documentation. The decision support tool also supplied a series of

tools for facilitating a public discussion of the project.

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

Collaboration sought: further research or development support.

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Use of singlet oxygen for disinfecting drinking water

The Aquacat project created a water disinfection treatment which used singlet oxygen (O_2) as a bactericide. The team also developed a new family of photosensitisers to help produce singlet O_2 .

The majority of cases of gastrointestinal illness occur in rural areas of developing nations, where a supply of clean drink-

ing water may not be readily available. In order to help solve this problem, the Aquacat project has developed a low-cost, low-maintenance system for purifying drinking water by photocatalysis.



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The technology is based on sunlight, which generates hydroxyl radicals and singlet O_2 , a highly reactive type of O_2 molecule which can kill bacteria. In this way, sunlight can be used to purify contaminated drinking water. The Aquacat project developed new forms of photosensitisers. These chemical compounds undergo photoexcitation before transferring their energy to other molecules, thereby making the reaction mixture more sensitive to light. The photosensitisers are based on polycyclic Ru(II) complexes.

Researchers incubated water samples in the presence of visible irradiation and in the dark. The samples contained the micro-organisms *E. coli* and *E. faecalis* as well as different forms of photosensitisers. The data showed that the photosensitiser RSD4 was not effective in removing micro-organisms from water in the homogeneous phase. This was due to the anionic (negatively charged) nature of the biological membrane and the RSD4 photosensitiser. These factors were responsible for restricting interaction between the bacterium and the sensitiser molecule.

In contrast it could be seen that even at very low concentrations in the homogeneous phase, the complex RDP2+ resulted in highly efficient disinfection. The cationic (positively charged) photosensitiser RDP2+ interacted with the negatively charged membrane of the bacterium, resulting in highly effective disinfection.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4208

See also page 23 (offer 4225)

Poplar trees make wood and reduce carbon levels

Rising concentrations of carbon dioxide (CO_2) in the atmosphere are cause for concern globally. Scientists are researching as to how to offset this alarming trend.

Since the Kyoto protocol of 1997, goals have been set for the reduction of CO_2 emissions. As these targets are necessarily long-term, one solution to buy time is to use the principle of carbon sequestration. This uses natural or artificial carbon sinks as a reservoir. Planting forests is one obvious solution as rapidly growing vegetation absorbs CO_2 and holds it in leaf carbohydrates.

Free air CO_2 enrichment (FACE) technology has been developed to test this premise. Disappointingly, a recent study of mature forests indicated that there is no increase in carbon retention when CO_2 levels are elevated. Under certain circumstances, increased uptake of CO_2 supplied

at higher concentrations can be offset naturally by the plant's physiology. This so-called process of acclimation, whereby the tree adapts and down-regulates photosynthetic activity, is a threat to the success of the initiative.

However, Euroface project partners at the University of Essex investigated fast-growing poplar stands for their ability to remove excess CO_2 under a FACE regime. The scientists found that following coppice, or felling of a small section of the plantation, the net photosynthesis rate was no more than at ambient CO_2 levels. It seemed then that careful management was necessary to avoid this lowered CO_2 uptake.

However, the team then found that young poplar trees display physiological features that can compensate for this. A factor not considered in previous studies was that poplar trees of a certain variety were shown to be photosynthetically competent earlier at elevated CO_2 levels. Overall, they found that poplar trees were able to escape long-term acclimation by a high starch synthesis and carbon export rate.

As an added bonus, poplars can be used for rapid wood production. Provided poplar trees are grown with adequate water and nutrients, the photosynthetic carbon gain is proportional to the wood produced. The poplar therefore can be used as a carbon sink with the added benefit of producing timber crops.

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 > 4234

Maximising integrated transport options

Sustainable transport, a key feature of modern cities, is relatively new in implementation. Part of its service, however, is to understand what initiatives can be taken to improve already existing modes of transport.

Part and parcel of effective multimodal transport systems is making people aware of the options they have, the routes involved and their respective arrival/departure times. Identifying the needs of travelers, the EU-funded Miracles project undertook to provide intelligent transport information

systems. These provided real-time travel information as well as journey time for motorists on peripheral routes into and out of the city.

To this effect, Winchester in the United Kingdom implemented four information

systems that were deployed around the city. Information kiosks were put in key buildings such as a hospital and the tourist information centre, as well as in public areas such as the train station and the city centre. Also installed at the train station were three bus departure information systems (BDIS) providing routes and real-time arrival/departure times. For additional coverage, several information display units (IDU) were deployed at the

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How to see the wood from the trees

Designing experiments at the ecosystem level on how global change affects the biosphere has been at the top of the research agenda for some time now. Using free-air carbon dioxide (CO₂) enrichment, FACE scientists have tested the effects of elevated CO₂ on the physiology and development of plants.



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Forests contain more than 90 % of the carbon of the Earth's living organisms. Forests are not only ecologically important but wood is integral to the economy. It provides materials for building things as well as energy, paper and pulp. The properties of the fibres in the wood available affects the quality of these products.

Furthermore, to achieve sustainable development, the quality of wood is important because of the carbon-based secondary compounds. The biochemical components of wood such as lignin, phenolics and tannins affect the ability of the forest trees to resist the attack of pathogen and insects.

This study, conducted at Georg-August-University in Göttingen in Germany, addressed the relationship of wood quality with elevated CO₂ levels. This was part of the Euroface project, which investigated the effects of global change on forest and agro forest ecosystems utilising free-air CO₂ enrichment (FACE) technology. FACE experiments do not alter any other aspect of the test area except CO₂ concentrations and allow research on impacts of global change to be studied at ecosystem level.

The scientists employed biochemical methods and allometry (the link between shape and size) in this study. They examined the wood quality and structure of juvenile wood by microscopic technique and image analysis. To characterise the wood quality response to elevated CO₂, three species of poplar were investigated.

Most of the anatomical traits showed no uniform response pattern to elevated CO₂. However, the combination of elevated CO₂ and fertilisation with nitrogen resulted in overall losses in cell wall area, from 5 to 12 % in all three clones. The findings outlined in this research point to a future where climate changes may mean deterioration in the wood quality we see today.

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 > 4288

In pursuit of an idyllic urban environment

Urban centres often do not fare well when it comes to ranking optimum dwelling places. However, implementation measures taken to revamp a European city centre demonstrate that the city has the potential to offer a pleasant yet vibrant environment.

Making everyday surroundings more gratifying is one way to improve the overall quality of life, a never-ending quest. Being enclosed by concrete, noise and pollution has been known to induce added stress. Therefore it comes as no surprise that this pursuit would apply to urban environments.

The Miracles project has arrived at some progressive steps toward this goal and applied them in the city of Cork, Ireland. One of the major approaches was the expansion of the city's centre with pedestrian priority in mind. This involved widening the

pavements and pedestrian crossings on two of the main shopping streets and adding restricted access stainless steel bollards with watertight subterranean enclosures. Additionally, more aesthetically appealing chrome cycle stands and railings (for the public to lean on) and larger seating space made of marble were created. Limiting the number of car lanes and re-routing traffic away from the city centre were some additional measures taken.

As a result of these changes, the city centre seems more appealing as a shopping district and is more accessible for pedestrians and

cyclists. This in turn should bring economic benefits to the area, not to mention that encouraging the public to cycle and walk will also add to the socio-health benefits. As an extra bonus, the changes have given way to cultural events such as a film festival and rock band performances.



Cork, Ireland

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4302

continued from page 24 'Maximising integrated transport options'

premises of major employers. These would provide information to the employees on alternative travel options.

While the coverage was extensive, providing considerable information to the public at large, the project also required user feedback to determine how effectively the system was being used. Briefly, it was found that most users clearly felt the information was valuable and helpful, with more than

97 % of the users finding the information they required and 94 % of users found the kiosks easy to use.

A further part of the project aimed to validate the information gained from the research in an effort to affect better implemented policy on public and sustainable transport. Furthermore, the goal was to disseminate the results at a local, regional and even international level with

the intention of developing a best-practice methodology.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4352

Innovative sensors for pollutant gases

An advanced gas-sensing method which uses synthetic nanostructured media capable of responding in a chemical environment has been designed.

With natural gas heating systems becoming more common, there is a heightened awareness of the effects pollutant gases can have on EU citizens and the environment. As a result, constant monitoring and alerting as to the presence of hazardous gases such as carbon monoxide is necessary. Furthermore, the rise in the use of landfill sites in the EU has caused methane gas to be released into the environment. This increases pollution levels as well as the risk of explosions.

Given this, safe, dependable and cost-effective sensors have begun to make their way into residences and work places. The Nanophos project has developed innova-

tive phototonic nanostructured and nanocomposite media, which present feasible gas sensing capabilities with a 5- to 10-year application horizon. By integrating science and technology and through the support of industrial participation, devices and systems were tried and assessed.

The work consisted of a collaboration between the National Hellenic Research Foundation (NHRF) in Athens, Greece, and the University of Lecce, Italy. In 2007, an application was made to obtain a patent of the Nanophos sensors and venture capital companies were approached for a plan to produce the second generation prototype sensors.



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

Collaboration sought: further research or development support, joint venture agreement, licence agreement, marketing agreement, manufacturing agreement, venture capital/spin-off funding.

<http://cordis.europa.eu/marketplace> > search > offers > 4273

New concepts in layered oxide sensor structures

Research was undertaken into developing innovative optical sensors from novel nanocomposite materials. The work opened up new technological sectors for further investigation and exploitation in the future.

The aim of the Nanophos project was to develop new technology for optical metal/oxide multilayer sensors for detecting gaseous

agents and pollutants. The work addressed a number of issues related to the monitoring of air pollution and improvement of health and safety and industrial processes. Areas of application for the new sensors included natural gas processing, storing of pharmaceuticals, oil and gas exploration and improved monitoring of the food chain.

A multilayer structure was created using magnetron sputtering to deposit a film of metal oxide. Platinum, palladium, gold or zinc, and silicon or zinc oxides were then deposited from metallic targets while using argon or reactive argon/oxygen sputtering. During the dry etching process, hard

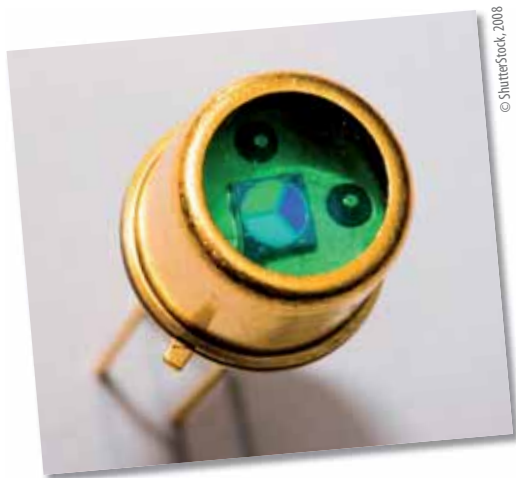
metal or silicon masks were developed and successfully applied. The desired pattern was initially developed in the hard mask and then applied to the metal/oxide multilayers. The mask protected selected areas of the underlying substrate during the process. The mask was removed and the diffractive structure below revealed.

A different approach was developed in order to pattern metal/oxide multilayers with refractory metals that were difficult to etch. This process used lift-off lithography and deposition of metal/oxide multilayers. During the lift-off lithography process the substrate was covered with material so care was taken to avoid overheating whilst sputtering was carried out.

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 > 4250



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Immigration control for invasive seaweed

Immigration control in Europe does not refer solely to Homo sapiens, it also includes the plant kingdom. For example, demographic models are providing insight into how to deal with invasive species of seaweed.

Sargassum muticum originated in Japan but has spread to many parts of the world, including European waters. Its pervasive nature can lead to negative effects on the local ecosystem, such as reducing light levels in sub-surface waters and obstructing boat traffic.

The Aliens project, funded by the EESD programme, sought to develop new approaches to managing invasive species. Scientists with

the Universidade do Algarve in Portugal led an effort to apply a demographic matrix model to study the population dynamics of *Sargassum muticum*.

The key finding from the simulation exercise was that the seaweed's strength lies in the longevity of its adult population rather than prolific rates of reproduction. However, when the proper conditions prevail, reproduction can play an important role.

One limitation of the model is that it does not account for immigration or emigration of individuals. Sufficient data on dispersion must be acquired before this aspect can be properly evaluated.

The Aliens demographic matrix modelling results will be exploited to develop appropriate control measures to manage *Sargassum muticum* populations.

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 > 4223

Simulation model to assess pollution caused by storms

A new model has been devised to help architects, engineers, policy advisors and other stakeholders to reach decisions based on an assessment of the risks posed by storm water in spreading pollution.

Urban development is radically affected by environmental hazards such as storms. That is why urban storm water management is important in order to ensure that factors such as the discharge of pollutants to surface waters as well as soil and ground waters can be adequately assessed.

A simulation model of the polluting affects of storm water has been designed as part of the Daywater project. It is capable of simulating long-term continuous effects of storm water as well as the impact of a sin-

gle event. It can examine storm water treatment and calculate for large catchments. It can be suitably applied to dimensioning facilities for the treatment of combined sewage.

As part of the planning feature which is incorporated, the model can plan single measures to entire drainage systems with on site and central elements. It can account for rainwater retention tanks, central infiltration facilities and rainwater sedimentation tanks.

The model can be used for studies, to test concepts and by architects and engineers for their planning phases. It is suitable for dimensioning by means of long-term simulation and has great flexibility because of its object-oriented programming. Variable customisation of the system behaviour is also possible.

Other characteristics of the software include an intuitive graphical user interface and CAD graphics in dwg (drawing) and dxf (drawing exchange) formats, GIS systems and aerial photos.

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 > 4299

See also page 18 (offer 4210)

Recreating sea surface temperatures in the Caribbean

The University of Gothenburg, Sweden, employed artificial neural networks to recreate a record of sea surface temperature in the Caribbean stretching several thousand years into the past.

The Atlantic Ocean is known to strongly influence the climate in Europe. Understanding and being able to predict the future state of the climate requires intimate knowledge of past conditions on Earth including its atmosphere and its oceans. The Pacliva project aimed to supplement records of sea surface temperature (SST) in the Caribbean, dating back over 8 000 years before present (BP).

Climate scientists with the Department of Earth Sciences at the University of Gothenburg studied a number of sediment cores gathered from the region. *Globigerinoides sacculifer*, a species of planktonic foraminifer, was used to carbon date sam-

ples from Puerto Rico, the Virgin Islands and other sites.

The next step involved deciphering SST from relative concentrations of planktonic foraminifera found at various positions in the cores corresponding to different periods in the past. Artificial neural networks (ANNs), trained on Glamap (glacial Atlantic ocean mapping) data and validated with COADS (comprehensive ocean atmosphere data set), were instrumental in this process. Statistical indicators, such as the root-mean-square-error of prediction (RMSEP), indicated much greater accuracy than other methods, in the order of 0.5 °C.

The Swedish researchers subsequently recreated SST time series for periods from 0–2000 and 6000–8000 BP. They discovered that past warm-season and especially cold-season SSTs were generally cooler than those observed in present times. However, the impact of the Little Ice Age was less evident than expected.

Sharper drops in SST corresponding to well-documented sunspot activity were successfully reproduced by the ANNs. On the other hand, solar maxima in the 6000–8000 BP period did not appear to warm the Caribbean as much as other regions. These findings will help feed climate research focusing on the role of the Atlantic Ocean.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4324

Finding hydrocarbon reserves with cyclopropane

EU-funded research has identified cyclopropane (C₃H₆) as an environmentally-friendly gas tracer ideal for use in exploration in underground hydrocarbon reservoirs.

Locating new reserves of hydrocarbons deep below the Earth's surface requires the use of gas tracers. Unfortunately, the gases commonly used, such as sulphur hexafluoride and perfluorocarbons, have global warming potentials (GWPs) several orders of magnitude greater than carbon dioxide.

A search for replacement tracer species was initiated in the context of Envitracer, an RTD project supported by the FP5. A number of

prospective tracer gases were investigated in the course of the project. In addition to not damaging the Earth's climate, the new compounds also had to meet the criteria of not being radioactive.

The research was headed by scientists with the Institute for Energy Technology (IFE) in Norway. Analysis of experimental data collected in the laboratory and in the field revealed that C₃H₆ was the best candidate

tracer gas. Its lifetime and flow characteristics resemble those of perfluorocarbons, but the GWP drawbacks are avoided.

IFE therefore recommended C₃H₆ for use as an environmentally-friendly gas tracer. On the basis that other potentially suitable gases were identified, work continued in collaboration with the other Envitracer partners to pinpoint alternative tracer species.

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 > 4304

Environmental education beyond the sandbox

In order for responsible use of sandy beach resources to become common practice, the public needs to understand its local environment. Primary school is a great place to start.

One way to preserve environmental quality in the Mediterranean is by identifying key links between elements of coastal ecosystems and influencing zones in the region. In light of this, the Medcore project has employed a transdisciplinary approach by targeting selected sand beach sites and their ecosystems in order to examine what contributes to coastal equilibrium.

The ultimate aim was to give local people a tool to improve the understanding of their own environment through understanding the problems related to a given scenario. In order to make the findings accessible, they were used as environmental education curricula in primary schools. In this way, the gathered scientific information could be brought to the local level. Schoolchildren

are a significant segment of the population since they can experience knowledge through family as well as in school.

Key concepts associated with the beach-dune ecosystem were first identified. Then the children's perception was analysed and new information and scientific knowledge was integrated and discussed. Some of the topics discussed included definitions of the beach-dune environment, relationships between ecological components of the beach-



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dune system, human behaviour on a beach and various human impacts.

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 > 4188

Mediterranean beaches: maintaining a regional treasure

The countries bordering the Mediterranean Sea have a vested interest in maintaining a high level of environmental quality in their coastal zones. Recent data collected regarding biodiversity highlights several important factors that must be taken into account.

The beaches of the Mediterranean are famous worldwide, drawing millions of tourists to the region every year. Unfortunately, this tremendous human influx threatens the health of such a remarkable natural resource. In light of this, the Medcore project brought together scientists from all corners of the Mediterranean to assess the impact of anthropogenic activities on coastal ecosystems in the region.

An investigation into biodiversity was led by the Istituto per lo Studio degli Ecosistemi of the Consiglio Nazionale delle Ricerche (CNR) in Italy. Parameters such

as the number of species, population sizes and distribution were recorded and analysed. CNR uncovered evidence that species diversity was directly related to habitat diversity. Consequently, areas subject to erosion which were often degraded by humans (e.g. trampling), had the lowest levels of biodiversity.

A fascinating component of the research entailed comparing arthropod species on opposite banks of the Oued Laou River in Morocco. CNR found significantly fewer species and smaller populations, especially crustaceans, on the left side of the river.

Extending their analysis to soil chemistry and morphology, they discovered that biodiversity was negatively correlated with pH, salinity and sand grain size.

While the relative importance of some factors varied somewhat between the study sites, CNR and its Medcore partners were able to draw some general conclusions. These form the basis of recommendations that can be applied to the entire region.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4266

See also page 21 (offer 4226)

Oxygen stress in Atlantic cod

The continuing decline in the conditions of our coastal marine ecosystems has a deleterious effect on many species. Researchers have investigated the effect of lack of oxygen (O₂) on one of Europe's favourite fish, the Atlantic cod.

Hypoxia, or O₂ depletion in an aquatic environment, can be due to various phenomena. In the coastal zones of Europe, it could well be due to algal blooms that give rise to the phenomenon of eutrophication. Bacterial degradation of large quantities of dead plant material cause the progressive decline in dissolved O₂ levels in the water. Needless

to say, this can have devastating results on the water quality and the food chain at all levels.

The Atlantic cod, *Gadus morhua*, is one of the main victims of overfishing over the past decades. It is one of the main fish presented in 'fish and chips' in the United Kingdom,

and is considered as the favourite in Portugal and the Basque country. Its preferred biome is in shallow waters from 20 to 200 m deep where eutrophication effects can prevail. Consequently, the EU-funded project Ethofish aimed to investigate the effects of hypoxia on coastal marine fish including *Gadus morhua*.

To assess the effects of a progressive decline in O₂ pressure, a Danish-based team within the Ethofish consortium subjected cod to

continued on page 29

Reversing the ageing process of European cultural buildings

As part of a European project consortium, scientists have been testing micro-organisms to find new methods to apply to the restoration of historical buildings. This study tested bacterial groups that could potentially be used on public buildings in order to restore the stone to its original condition.

Historical stone buildings make up an important part of European heritage. Unfortunately, these buildings are difficult and costly to maintain. Urban pollution causes damage to materials, which means that frequent labour-intensive restoration work is necessary.

The EU-funded Biobrush project, made up of a six-partner consortium, has identified the need to develop novel approaches to these restoration problems. Research institutions involved in the project have studied the possibility of using bioremediation, micro-organisms and their enzymes, to return the stone of these buildings to their original state.

This study was conducted by scientists at the School of Biological Sciences in Portsmouth. They tested sulphate-reducing, nitrate-reducing and biocalcifying bacteria. The biocalcifying bacteria were taken from a stream in Somerset, United Kingdom, which provided 70 cultures. These samples were screened for their ability to deposit calcite in solid and liquid media.

The nitrate-reducing bacteria studied were isolated from limnic, marine and various soil environments in order to obtain salt-tolerant microbial strains. The results showed that 12 out of the 36 pure cultures

tested were found to be highly active. Bibliographic searches on three different bacterial groups were also conducted. These were then presented in separate volumes.

By exploring processes involving micro-organisms, treatment combinations can then be used to return the natural environment, altered by contaminants, to its original condition. Once the laboratory tests have been conducted and the appropriate micro-organisms isolated, delivery systems can be examined. The project aim was that these treatment combinations be applied to buildings so performance and risk can be assessed. This was done under the different climatic conditions of northern and southern Europe.

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 > 4206

Algal invasions on ship hulls

The presence of large shipping fleets in foreign waters introduces a variety of environmental problems, from pollution control to custom's legal requirements. A recent EU-funded project has identified another source that may be introducing a previously unconsidered threat: an algal invasion carried on the hull of ships.

With more than 200 million Europeans living within 50 km of the sea, its resources for trade, tourism and recreation are of vital importance. Ensuring that the 89 000 km of Europe's coastline remains intact and clear of threat is the purpose of the Aliens project.

As part of this project, specific protocols were developed to deal with the ecosystem threats carried on the hull of ships. The need for this has arisen because of increasing sea-based trade and from other factors such as bio-erosion and the growing risk of genetic transfer from non-native species.

The protocol sets out to identify the algal species carried on the hull of ships while

they lie at anchor in harbours. On arriving at the port, authorities will establish informal contact with the captain of the ship, explain the sampling programme to them and request authorisation to do so. To be as thorough as possible, information about shipping lanes and traffic should be attained on a daily basis.

While further research is needed, the project aims to establish these controls as a means to prevent foreign invasions.

An example of this occurred in Ireland with *Sargassum muticum*, a large brown floating seaweed that was introduced there in 1987.

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 > 4244



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a reduction of O_2 level over a period of an hour. This represented an initial chronic situation of 20 kPa that was rapidly reduced to an acute 4 kPa at 10 °C.

This rapid decline in O_2 level induced a very negative physiological response in the cod. Fish display behavioural patterns characteristic of their species including changes in vertical position and sudden accelerations in speed. The cod showed signs of an increase in physiological stress status

that was reflected in suboptimal swimming speeds. Overall, the observed behaviour strategy in cod indicated that survival rates under large and rapid reductions in O_2 would be very low.

Sustainable management of aquatic resources will continue to depend on data that reveal the intricacies of responses to changes due to pressures from pollution and climate change. For conservation of already threatened species such as the

cod, this is of prime importance. For more information on the project, please visit: <http://www.ifremer.fr/ethofish>

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 > 4071

Cooperative forest fire surveillance

Real-time monitoring of the evolution of a fire can be invaluable for forest fire fighting. For coordinated wildfire monitoring using multiple unmanned aerial vehicles (UAVs) and ground autonomous systems, a distributed communication system has been developed within the Comets project.

UAVs controlled by a single system can be used in rescue and intervention missions where ground vehicles have inherent limitations in accessing the desired location. In particular, unmanned helicopters have proven to be valuable in those cases where aerial vehicles offer the only way to approach the objective and perform tasks due to their manoeuvrability.

Helicopters are well suited to agile target tracking as well as inspection and monitoring tasks that require them to remain in the same position and obtain detailed views. The Comets system has been designed to allow the cooperation of multiple helicopters for forest fire detection and monitoring. Several UAVs can provide simultaneous views of the event being monitored, thus improving the perception of the event and allowing each aircraft to benefit from data gathered by others.

In such a multiple UAV system, autonomous deliberative activities require the consideration of temporal constraints, high uncertainties on tasks execution and stringent reactivity to contingencies. Moreover, ground operators might want to take control over UAVs when necessary. Comets hence required an architecture integrating a distributed communication system that covered wired and wireless links.

Small aerial vehicles impose severe limits on power consumption and size of the on-board computers, making it necessary to process most of the aerial images and data collected off-board. Therefore, besides establishing interconnections within the UAVs' fleet, there must be peer-to-peer connections with the ground stations. For further information about the multiple UAV system Comets, please visit: <http://www.comets-uavs.org>

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

Collaboration sought: further research or development support.

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Electronic control of molecule-sized sensors

The Spot-nosed project has successfully developed the first olfactory nano-biosensor array. The necessary electrochemical measurements are performed by a novel electronic instrumentation system.

Combining knowledge and experience from a multitude of diverse scientific fields along with innovation and ingenuity, has made the development of a minute bio-sensor a reality. The EU-funded Spot-nosed project has manufactured a nano-biosensor array. The scientists have anchored a single olfactory receptor between two metallic nano-electrodes. Changes of the electrical properties of the receptor are recorded and constitute the detection signal. This resulting nano-transducer is the basic component of the biosensor array.

To implement their ideas, Spot-nosed project partners used nano-lithography and microelectronics for the metallic electrodes,

and biochemistry and biotechnology for isolating and controlling a sufficient number of olfactory receptors. An olfactory receptor, the sensor's detection system, selectively detects and distinguishes odour molecules.

The single protein nano-biosensor grid array can perform electrochemical characterisation of many different samples with the aid of electronic instrumentation developed specifically for the array. Other commercially available electronic systems not only cost more but, more importantly, fail to drive and control the nano-transducers of the array properly. In contrast, the measuring system developed by the Spot-nosed project partners easily adapts

to electrodes ranging from micro- to nano-sizes. The nano-chip, with the aid of a board, fits perfectly into the electrochemical cell.

Two different electronic front ends have also been developed for the micro and nano range of electrodes respectively. In the micro case, the front end draws 1 μ A maximum current with a 2 MHz signal bandwidth. Corresponding values for the nano range are reduced to 10 nA maximum current and 0.9 MHz signal bandwidth.

With elaborate software codes, effective generation and acquisition of signals resulting in efficient data handling is easily achieved.

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

Collaboration sought: licence agreement.

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Sensor technology for studying crickets

Research and development (R & D), scientific theorisation and validation have often turned to the world of insects for inspiration and emulation. An EU-funded project has looked at the world of crickets to develop super-sensitive sensor technology.

The Cicada project investigated how the super-sensitive structures of a cricket developed, and how these worked in relation to the cricket's 'software'. They found that typical neural responses were based on the angular displacement of hairs. As small a displacement

as 0.001 degrees in a wind velocity of millimetres per second or less was enough to trigger a response. They also discovered that such sensitivity was directly related to the structural nature of the socket-hair subsystem and the mechanical nature of the involved tissues.

The actual mechanisms are more complex than described. For example, the sensitivity is also based on an amplifying system and the specific construction of the individual parts. The elasticity of the rubber-like membrane that anchors the base of the hairs, for instance, determines the stiffness of the rotational spring. This was found to be critical to mechanical response of the individual hairs.

continued on page 31

Online application performance monitoring

A new service has been developed within the Crossgrid project to provide user access to essential information on the Grid's resources. The JMX-based infrastructure monitoring system (JIMS) aims to enable users to run their applications on the Grid in an easy and transparent way, without needing to know details of the Grid structure and operation.

The primary objective of the Crossgrid project was to further extend the Grid environment to a variety of applications of great practical importance. Project partners were interested in applications that required a response from the distributed computer system to an action by a user in different time scales (real time or longer time scales). These included interactive simulation and visualisation for surgical procedures, crisis decision support systems and distributed data analysis in high energy physics experiments that are compute- as well as data-intensive.

To enable efficient development of this category of applications for the Grid environment, new tools for the verification of parallel source code, performance evaluation and monitoring were needed. More specifically, new services were added for the applications

monitoring, while existing services dedicated to monitoring the Grid infrastructure were extended.

JIMS was developed by the AGH University of Science and Technology in Kraków to gather and expose information on the state of the devices used to build the Grid environment. The idea was to reuse a standardised Java management extensions-based approach to enable monitored devices to expose their operating system parameters to a database system in a unified way.

Moreover, JIMS is a visualisation tool, which allows users to observe the CPU load, RAM and the file system usage statistics dia-

grams for a chosen worker node, where each application runs. Among the most valuable system features is the ability to dynamically deploy and revoke monitoring agents. The last validated version of JIMS has been installed in a production as well as development testbed and proved to perform efficiently for a growing number of applications.

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

Collaboration sought: further research or development support.

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Visualising distributed applications' performance

Distributed computational resources should provide the expected performance necessary for large-scale industrial or scientific simulations and complex visualisation using the Crossgrid online monitoring infrastructure.

For many large-scale problems, such as earth observation, industrial and scientific modelling, as well as biomedicine, new approaches to computing are continuously required. The Crossgrid project sought to address realistic problems in environmental protection, surgical planning and analysis of large volumes of data from the high-energy physics experiments conducted at CERN.

Whilst existing solutions only enabled such Grid applications to be run in a batch mode, with Crossgrid it is now possible to monitor the progress of the application's execution. More specifically, the concept of interactive Grid computing was supported

by innovative products developed to permit changes in the application's parameters and ensure that end users receive output on the fly.

G-PM, providing a basic measurement system, was created at the AGH University of Science and Technology in Kraków, Poland, for monitoring grid systems through user-defined metrics. Prompted by the user when applying custom metrics, the server can perform asynchronous 'probes' to read and write the state of the application and return measured data. Furthermore, custom metrics can be derived automatically from an existing set of metrics.

The G-PM tool consists of three main components. The performance measurement component (PMC) provides the functionality for standard performance measurements of both Grid applications and the Grid environment. The aim of the high-level analysis component (HLAC) is to provide application developers with application-specific data, based on a metrics specification language that can combine performance data from different sources. Finally, the user interface and visualisation component (UIVC) allows the user to specify performance measurements and visualise the performance data collected.

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

Collaboration sought: further research or development support.

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continued from page 30 'Sensor technology for studying crickets'

As well as characterising the relevant morphological values involved, the project also set about to construct correlations between the morphological and geometrical parameters. Various methods were employed to obtain this dataset. For example vibration methods and high speed cameras were used to determine the elasticity of the hair supporting membrane. The project made use of laser Doppler vibrometry and

high-speed cameras. They showed that the hairs 'follow' the stimulus and appear to be in 'tune' with it, over a vast range of frequencies.

The ultimate purpose of assessing such systems is to be able to eventually use this knowledge to develop miniature artificially life-like sensor systems. Moreover, by combining cross-disciplinary data, from sen-

sory ecology to micromechanical systems, it is hoped that significant advancements in biomimetic life-like perception systems can be achieved.

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

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

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New tool created to judge Grids

Evaluation of the performance of Grids and Grid resources is difficult to do but a layered approach has been found to be a good approach. Researchers at the University of Cyprus have led the way with the EU-financed project Crossgrid and the creation of the GridBench tool.

Computer Grids, otherwise known as 'distributed computing' are used to work on processing data intensive problems. They work by permitting the distributed processing of data and objects across a network of connected systems. It has developed as an alternative to the supercomputer.

The future aim is that multiple and geographically dispersed research groups will have the capability to pool their computing and data management resources. Therefore, results can be generated that would not be possible if each were working alone.



Practically, this tool has been implemented on projects that try to predict global climate change, deal with earthquake monitoring, or develop drugs to combat cancer and AIDS.

The internet raises many questions regarding the performance characterisation of Grid infrastructures. Benchmarking

metrics published on the Grid can provide a basis for users to assess the 'quality of service' expected by a virtual organisation (VO) providing computational services at a given cost.

Scientists based at the University of Cyprus have put together GridBench. It is designed to be a user-friendly system and enables various performance and reliability analyses to be made. It facilitates the easy definition of parameters on the Grid and allows for the archiving and retrieval of results. It is also possible to use the results to create customised charts and graphs. New benchmarks have been added to the already established high-performance computing (HPC) benchmarks that have already been tried and tested.

Expected users are Grid end-users and Grid infrastructure operators. They can use GridBench to assess the performance and functionality of their resources.

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

Collaboration sought: further research or development support.

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Improving occupational safety of miners

Tests are being carried out in a mining company in northeast Estonia, a region where the mining industry holds national importance. Researchers at the Ardoran Institute have focused on developing a solution to the problem of the existing lack of reliable communication technology available to connect the surface and the underground mine in an emergency situation.

There have been a number of mining tragedies in the past years that have resulted in loss of life, had a drastic environmental impact and caused considerable socioeconomic damage upon for the surrounding area.

In 2007, big mining explosions occurred in China and the Ukraine. In the EU, the Pyrite mine explosion at Aznalcollar in Seville, Spain, blew up in April 1998. These events underscore the critical need for improved occupational safety for those working in mines and in particular, better reaction speed and preventative measures to be taken if an explosion were to occur.

In Europe, mining is still active for various industries, extracting coal and oil, metals such as zinc and silver, potash for fertiliser and gypsum for cement. The dangers in mines such as fires, cages falling, explosions and flooding are made all the more difficult by the lack of an operative communication system at the time of these accidents.

The Ardoran Institute, as project partner of Wirenet, will be working with the mining company with a view to implementing a system based on the WireNet technology. Since WireNet is based on ultra-wide band (UWB) principles, it offers the possibility of transmitting the intercom signals via the mains cable and then re-transmitting throughout the mine area. This will involve development of a WireNet UWB-radio interface converter and works in an emergency situation.

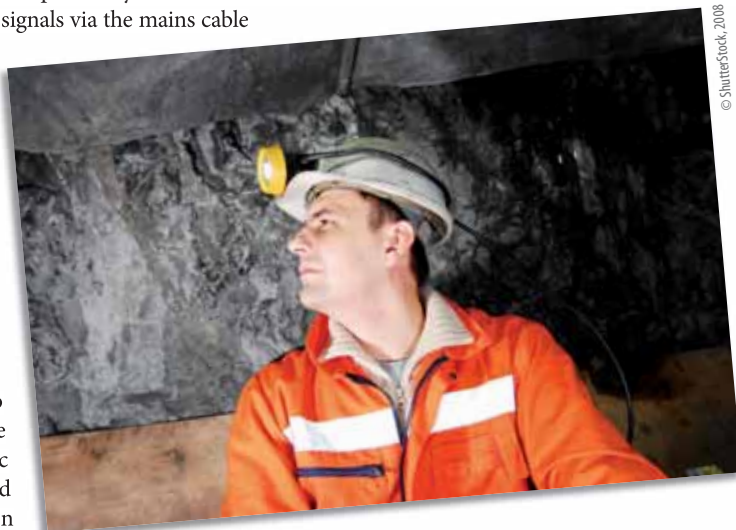
Currently radio systems from the Czech Republic and the United States have been

evaluated and found to be unsuitable. The WireNet solution provides a simpler topology compared to the mains power wiring in domestic and industrial premises. Since the power cable down the hole has only one input and one output it is more suitable. It simplifies the transmission and filtering requirements.

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

Collaboration sought: further research or development support.

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Simple and secure networked home

Most people will only start to control equipment remotely in their homes when they believe it is simple and safe to do so. A newly developed control system provides personalised answers.

Software that enables people to control the audiovisual equipment and white goods in their home through one simple, remote interface has been demonstrated by researchers on the ESTIA project.

New networked devices are automatically recognised by the system, and the network can be administered using a wide range of devices readily found in the home, including TVs, cordless phones, handheld PDAs (personal digital assistants), or PCs.

Increasingly, multimedia equipment and even ovens, washing machines and tumble driers in our homes can be controlled remotely. While we see the benefits, few of us are firing up the oven from work so dinner is cooked when we arrive home. Why?

There are two main reasons we are reluctant to tap into home networks, according to Professor Lars Dittmann, a lead researcher in the EU-funded ESTIA project which studied what is needed in an enhanced networked environment for personalised audiovisual content and appliances.

Firstly, he says, people perceive the control of networked devices as too complicated — particularly as the thousands of 'networkable' devices available for the home tend to have their own proprietary control systems. There is also a trust issue. Parents, for instance, worry that if it is possible to turn the oven on over the internet, their children

will learn how to do it with potentially catastrophic consequences.

The ESTIA team sought to address both these issues by producing a single, simple and easy-to-use interface for all networked devices, and by giving each network user a personal identity with different access rights.

'For example, it would allow people entering the house to type in a four digit pin code on a pad by the door,' says Dittmann. 'If there was an adult in the house, the children would be able to use the oven or microwave, but they couldn't if they were home alone. Similarly, it is a way to control or block content on the TV.'

As well as the residential gateway software, for control of the home network via an internet connection, the team also developed a home media gateway — a set-top box using Windows Vista, that allows a higher level of administration and control.

The ESTIA home networking architecture selects and uses whatever networking technologies are available — from internet protocol (IP)-based networks to KNX. KNX, or 'European installation bus' as it has been known, is a wire-based platform for building control systems. Based on this physical infrastructure, ESTIA defined a set of higher-layer interfaces for machine-to-machine and person-to-machine interoperability.



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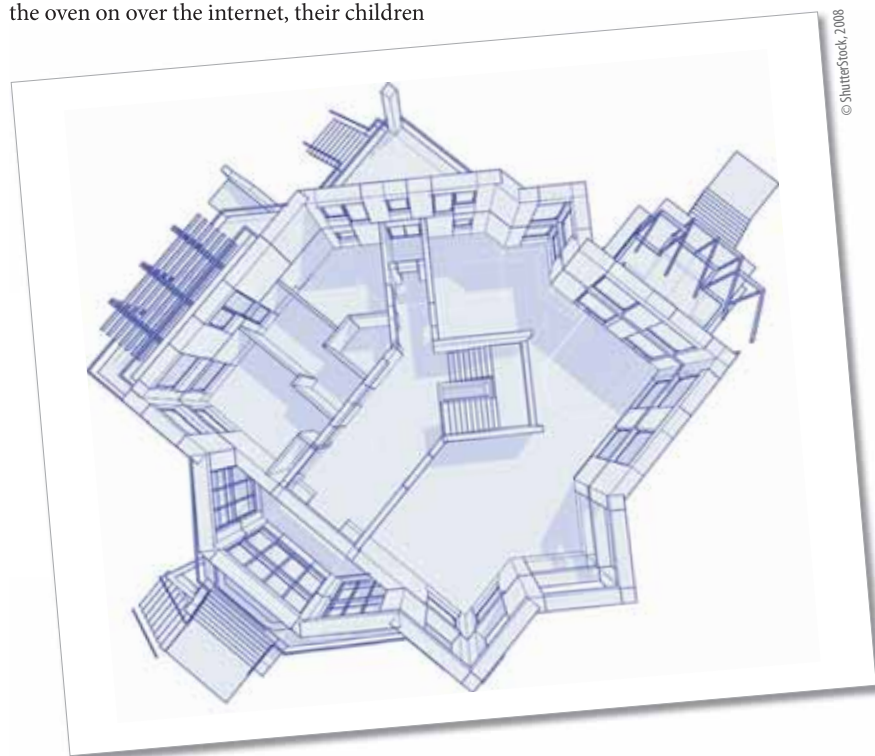
'We don't believe that we have set the ultimate standard here,' says Dittmann, 'but we believe we have moved the debate ahead by demonstrating that network control systems don't have to be too complicated. It is simple for anyone who can use TV text to set up a device and an administrator, after connecting a device, can decide that it should only be visible or controllable by certain people.'

Having all devices on a single network and sharing one interface adds considerable flexibility and enables home users to personalise the services they use. For example, when a meal is ready in the oven an alert could pop up on the television screen in the living room.

Some of the participants are incorporating elements from ESTIA into their next-generation products. Keletron is introducing ESTIA's audiovisual handling core logic in its product portfolio and presenting this to potential customers considering gateway installed services.

All of the companies that participated in the ESTIA project, including Siemens and the Slovenian white goods group Gorenje, have gained a lot of experience in how to exploit the commercial potential of a personalised home-networking control system, according to Dittmann. Moving forward from that point will require consensus.

'We demonstrated that devices could be automatically recognised by the network. To move forward requires the manufacturers of home-network-enabled devices to agree on a number of standards,' he concludes.



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<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/BrowsingType/Features/ID=89970>

Internet law made simple

Internet law is a new frontier where small and medium-sized enterprises (SMEs) fear to tread. Now European researchers have created a new internet law wiki designed to encourage more SMEs to go online.

The internet has enabled a brave, new world of online commerce, pushing new ventures and large corporations to launch confidently into cyberspace.

But SMEs have lagged far behind, held back in large part because they lack reliable information about their online legal obligations. Without the enormous resources of a legal department, many SMEs fear the potential repercussions.

Now European researchers have developed what is probably the first internet law wiki written for non-experts. A wiki is an online information source contributed by the users, like Wikipedia.

'Fear of legal problems is one of the main reasons why SMEs are slow to launch internet-based services, from e-commerce to online marketing,' explains Margaretha Mazura, initiator of the Lektor project.

SMEs have good reason to be fearful. Internet law across Europe represents a patchwork of varying standards. Even where European directives exist, the national regulations implementing the directive vary from country to country.

For example, the regulations regarding business-to-consumer spam are well established, and consumers must opt-in every time. But in the business-to-business space, spam rules vary from opt-out, in Italy for example, to opt-in in Germany.

There are other considerations as well. Consumers can legally return goods, no questions asked, from 7 to 15 days after they have received it, depending on their place of residence. The length of time, again, varies from country to country.

But mailing time is not counted, so some SMEs will face a 'cooling-off' period that can effectively last a whole month between

the time it takes to mail a product and the consumer's statutory rights.

'It is vital for SMEs to know what regulations apply to which country, to respect them, and then to adjust their cash flow to reflect their obligations,' notes Mazura.

The issues become even more complicated across the world, where the variety of regulations in force proliferates. Finally, the law as it applies to the internet is changing all the time, as legislators create new laws and the courts establish new precedents.

Enter the Lexerator, Lektor's free Web 2.0 information platform for internet law. 'Web 2.0 refers to the sharing, collaboration and interactivity typical in many of the most successful online services that have launched in recent years,' Mazura explains.

Lexerator is an online information source for legal information, aimed at SMEs who want to start e-commerce or internet services. Even companies with established internet-based services can use the platform to ensure they are compliant with all relevant regulations. And while the service is aimed at SMEs, there is plenty of information that is useful for consumers, too.

It provides non-technical information, supplied by experts in the field, relating to internet law. The EU-funded Lektor project created the platform using an open source content management system, called Drupal. Drupal enables a wiki, blogs and forums.

'We didn't use the Wikipedia software, which is also open source, because any users can post information,' says Mazura.

Lektor used Drupal because it allows levels of access for different users. Ordinary surf-

ers, from consumers to SMEs to anybody else, can read all of the information. However, registered users have more input. They can apply tags, contribute to forums and add comments to the blogs.

Registration is simple enough, and only requires a real email address. But the top level of access is reserved for contributors. 'We check contributors manually, using our panel of experts around Europe, to establish that the contributor has a sufficient level of expertise to write an article on internet law,' stresses Mazura.

This makes Lexerator better than a wiki, because users can be confident that there is a proven level of expertise in the content.

'Most of the contributors come from universities, or law firms who want to raise their profile,' Mazura notes. 'And they are not remunerated.'

'The choice of contributors was deliberate, because we're hoping to keep the service as low cost as possible, so it will remain sustainable,' says Mazura, who is secretary general of the European Multimedia Forum, the group currently hosting Lexerator.

So far, the wiki is in English, but there are a number of blogs in a variety of languages that provide similar information, and all information is searchable. Moreover, registered users are able to add tags, so if there is a discussion about advertising in the wiki, French-language users can tag it 'publicité', for example, considerably enhancing the search function.

Finally, the forums offer registered users an opportunity to discuss the issues relevant to their circumstances.

Lektor is keen to promote the service which has already been presented at the eJustice conference held under the aegis of the Slovenian EU Council Presidency. It will also be presented at a conference of the World Intellectual Property Organisation in Geneva later in 2008. There have been dozens of other workshops run by Lektor.

The research programme also had a global appeal, with partners in Chile, India, Italy, the United Kingdom and the United States.

'We are building a critical mass of users and contributors around the world, and we hope the service will continue to track the rapid change in online law,' says Mazura.

The Lektor project received funding from FP6.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/BrowsingType/Features/ID=89984>



Ontology approach for the Semantic Web

An ontology-based approach for supporting the development and administration of software components in an application server has been developed.

The development of the Semantic Web offers data content able to be processed by machines, giving way to a wide range of intelligent services. Ontologies have played a key role in this, since they define shared and common domain theories and

assist users and machines in communicating more effectively. They fill various needs in the Semantic Web such as the storage or exchange of data which corresponds to an ontology, as well as ontology-based reasoning or navigation.



In light of this, the Wonderweb project has created the necessary infrastructure for the vast preparation of ontologies for the Semantic Web. This has included both the creation of web standard ontology languages as well as the simultaneous design of ontological engineering technology. Supporting

the development and administration of software components in an application server via an ontology-based approach serves to alleviate the problems previously associated with application server functionalities.

The main difference with using the ontology-based approach lies within the conceptual model. On the one hand, with the application server, the conceptual model was only implicit, making it difficult to retrieve, survey, validate and maintain bits and pieces of different configurations. On the other, the ontology is an explicit conceptual model with formal logic-based semantics. It can therefore capture properties and behaviours of, and relationships between, the components necessary for development and administration purposes. Therefore this approach maintains original flexibility in configuring and running the application server while also adding novel capabilities for the system's developer and user.

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

Collaboration sought: further research or development support.

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Development of foundational ontology for Wonderweb

The next generation of the World Wide Web is the Semantic Web, which will allow a whole spectrum of intelligent services to be provided. The Wonderweb project has developed ontologies which are central to this effort.

By defining shared and common domain theories, ontologies enable people and machines to communicate more effectively. The descriptive ontology for linguistic and cognitive engineering (DOLCE) is a foundational ontology developed as part of the Wonderweb foundational ontologies library (WFOL). The library's development has been defined by a need for reliable foundational ontologies. These served as a reference point for development, providing a rigorous basis for studying, harmonising and integrating existing ontologies, as well as metadata standards.

The WFOL involved extensive research, with each module in the library undergoing careful evaluation by experts. The first module of WFOL was DOLCE, which was not a candidate for a universal standard ontology. It was, in fact, a starting point for comparing and explaining the relationships with the other modules in the library. It also aided clarification of existing ontologies or linguistic resources like WordNet. DOLCE focused on particulars rather than generals.

Properties and relations are usually considered as universals and therefore they were not classified by this ontology. DOLCE took a multiplicative approach, whereby different entities can be located in the same space-time, which allowed assumptions to be made regarding incompatible essential properties.

DOLCE has become a standard in formal ontology and is now used by researchers around the world. It is available in a number of formats, including knowledge interchange format (KIF) and Web ontology language (OWL). Applications that have used DOLCE as a tool for the semantic integration of data cover many areas, including computational linguistics, agriculture and medicine.

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

Collaboration sought: further research or development support.

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Software imaging of muscle construction

The Multisense project has developed an innovative software application capable of translating a patient's computed tomography scan into a musculoskeletal model.

The ability to clearly visualise musculoskeletal structures enhances our understanding of human functional anatomy. An accurate three-dimensional image of anatomical objects can be an indispensable diagnostic tool for a number of medical fields but also a roadmap for more efficient biomedical engineering.

To address the rising need for a better look into our muscle construction, the Multisense project has developed user-friendly interfaces that input data from a multitude of possible sensors. These essentially output a patient-specific musculoskeletal model.

A haptic interface for example, interfaces the user via the sense of touch by applying pressure or vibrations to the user. Such an interface can be extremely useful in simulating palpatory diagnosis.

The Multisense project partners realised also that such multimodal and multisensory interfaces would be more attractive to medical professionals if the input data are clinically relevant. Computed tomography (CT) scans are an excellent example of relevant data. These

scans are created from the reflection of X-rays (usually) and provide a visualisation of human anatomy.

For CT scans as input data, the Multisense project partners have successfully developed a man-machine language (MML), an interface capable of creating musculoskeletal models. This MML preprocessing unit obtains bone, muscle and skin surface structure from a patient's CT scan. Moreover, the developed software application supports the digital imaging and communications in medicine (DICOM) format, which includes a standard file format definition and a network communications protocol for medical information processing.

Combining a virtual palpation procedure with an advanced operation that curves tissue surfaces to the desired shape, Multisense project partners can now provide us with an accurate musculoskeletal atlas.

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

Collaboration sought: further research or development support.

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Smart non-destructive inspection tools

Besides the development of new and innovative non-destructive inspection technology, the improvement of the daily work of aircraft component inspectors was the ultimate aim of the INDET project.

Advanced technological developments such as high rates of data transfer and mobile information input/output devices have allowed new usage scenarios for technical documentation. Within the INDET project, different usage scenarios were customised to suit the specific needs of aircraft maintenance.

Major aircraft manufacturers and information technologies (IT) developers were brought together to replace current paper documentation with a digital support system. With the aim to contribute to improved inspection conditions, enhanced reliability and maintenance costs reduction, a compact system implementing multimedia procedures was developed on a tablet personal computer.

The multimedia design, made possible by electronic documentation systems, allowed the preparation of maintenance instructions in a totally new form. Video sequences demonstrating inspection procedures as well as three-dimensional modelling of the inspection situation replacing traditional two-

dimensional drawing represent only a few of the possibilities offered. Evaluation aids such as a catalogue of possible defects and displays of the inspection equipment along with expert systems were integrated into the 4M multimedia maintenance manual.

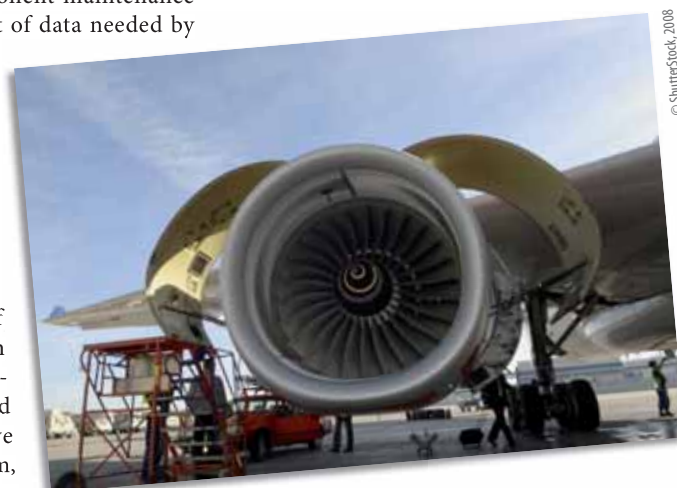
Moreover, relevant data could be stored during aircraft component maintenance and the exact amount of data needed by inspectors rendered easily accessible through web servers. The 4M multimedia maintenance system will enable the generation of procedures on demand after computer-controlled input of the actual inspection problem. Such a technology implemented on a non-destructive testing (NDT) platform, in which information

could be would be readily consulted and modified, could enable worldwide online support from maintenance organisations. This possibility would be of great interest for the life cycle monitoring and NDT data management during the whole life of an operating aircraft.

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

Collaboration sought: further research or development support.

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Fits like a glove

Scientists based at the University of Salford, United Kingdom, have designed a new hand haptic device made up of resistance and electromagnetic sensors. This study contributes to the advancement of the biomedical profession and has the potential to improve understanding of physiological and pathological conditions.



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The research forms part of a larger project dealing with the functionality of the human anatomy and the physiological and pathological conditions associated with it. Such research undertaken by the Multisense project, it is hoped, will speed up the progress being made in the medical field and industrial areas such as biomedical engineering. In particular the focus has been to find a way to represent the functional anatomy in a 3D way, which up until now has proved very difficult. Creating such 3D representations will enable the visual and virtual manipulation of these anatomical objects and so enable innovative techniques to be tested.

Scientists at the University of Salford have turned their attention to the creation of a hand exoskeleton structure. It can be used both to simulate the hand

and to support it, as it strengthens the overall movements, grasping and flexing. The device operates on the index, middle and ring fingers and the thumb, providing a feedback force from the dorsal side of the hand. The feedback forces are generated by direct current motors mounted in a low-profile power pack and are transmitted to the fingers by low-friction pull-cables. The device allows for the measurement of the finger flexion, which is possible due to the combination of flexible resistive sensors and electromagnetic sensors embedded in the glove.

The device is made out of a soft lycra glove and a metallic structure; this enables ease of movement and allows for the measurements to be taken. The incorporated glove, unlike other systems, is part of the exoskeleton structure and thus it is faster to put on and take off. It is designed to fit a range of hand sizes and for this purpose it incorporates adjustment levers that allow fast and easy adjustment of the metallic structure for the three fingers.

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

Collaboration sought: further research or development support.

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Matching assistive devices to individuals

Assistive technology has helped many people with disabilities. This research provides a way of improving the way the technology is used by providing a method assessors can use to recommend the optimal device for each person.

Assistive technology (AT) refers to devices which assist a person with disabilities to perform tasks that are otherwise very difficult or impossible for them. The technology is designed to allow them more independence from carers and to push forward confidence in their skills. One key feature of AT is that it is designed keeping those with permanent disabilities in mind, rather than being geared to those rehabilitating.

The I-MATCH project was concerned with matching AT to the specific user and their individual skills. This is important because disabilities of individuals are as different as the people concerned. Degrees of disability vary and many factors must be considered if AT is to be used effectively. This is why the researchers involved have designed a method for assessors to use in order to recommend the optimal device in each individual case.

Using a virtual environment, users were able to experiment with different devices, enabling them to consider the advantages and disadvantages of each. Users can be reluctant to use AT at first. It was observed that when training was provided they were much more likely to adopt the technology.

A wheelchair which had haptic devices, switches and joysticks was tested by users so they could decide which of these controls were more suited to them. Upper limb performance tests were carried out using specially designed software. Reports were then produced which allowed the assessors to recommend the most appropriate interface. The decision support system was then put together. It allowed for systematic comparisons to be made which, based on a score system, allowed for better assessments.



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

Collaboration sought: further research or development support, joint venture agreement, information exchange/training, available for consultancy.

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Relays pass baton to next-gen broadband networks

The ideal of affordable wireless broadband for all — and as an added bonus, better quality services in urban areas — is a lot closer thanks to recent advances made by European researchers.

The next generation of broadband wireless networks is set to be simpler, cheaper for both operators and consumers, and more efficient than current technology permits. This is due to the innovative use of relay stations to boost the signals from base stations.

The Fireworks project will deliver fourth-generation (4G) broadband wireless access (BWA) systems to remote communities despite difficult terrain and low population densities.

In cities, where large buildings and thick walls can block or interfere with wireless signals, relays are a cost-effective and easy to deploy way of boosting reception to the end-user.

The EU-funded project concentrated on OFDMA (orthogonal frequency division multiplexing access)-based networks and specifically those designed for BWA, particularly worldwide interoperability for microwave access (WiMAX) and WiFi. OFDMA networks have different characteristics and deliver signals in a different way to traditional fixed-line and cellular networks. OFDMA is already in widespread use and the technology will continue to be used for next-generation networks.

WiFi local area networks (LANs) are familiar to most people, with 'hotspots' where anybody can connect to the internet via

laptop to be found in airports, cafés, hotels and other public areas all over Europe and internationally. The next evolution of WiFi is Mesh WiFi, where the individual hotspots are seamlessly linked together to form larger networks. WiMAX is designed to provide much wider coverage, which in a city would be a metropolitan area network (MAN).

'Relay stations are much smaller than base stations and are much easier to deploy — they can be fixed onto lamp posts for example,' says Fireworks' technical manager Dr Antonis Valkanas. 'They also should only cost around one-fifth of the price, as the intelligence is in the base station and, unlike base stations, they do not require a directed backhaul connection to the internet.'

Fireworks' systems will also be able to provide, for the first time, seamless operation between WiMAX and WiFi networks, so somebody on the move with a mobile device or laptop will not notice the switch from one to the other.

One of the main challenges facing the researchers was the problem of how to maximise the gain from overlapping transmissions. The information can be accessed from either the relay or the base station at any one time, or by simultaneous transmissions by both of them.

The project was able to deliver new algorithms — small software packages — which ensure that, whatever transmission protocol is used, the best combination and clearest reception is assured.

With this problem solved, it is possible to extend the range of networks into previously inaccessible areas, whether due to high cost or rough terrain. It also is now possible to boost reception in urban blackspots by positioning relays where base stations are not feasible.

While the main benefits of Fireworks are not likely to be felt until the next generation of BWA networks start rolling out in Europe, from 2010, a prototype system has been developed to prove the viability of the relaying concept.

In fact, so successful was Fireworks that the EU has agreed to fund a follow-up project with the same core consortium.

Project Rocket kicked off in January 2008, and will be both taking the techniques used in its predecessor forward and looking into other areas only previously touched on, such as the most efficient use and allocation of spectrum for BWA services.

The systems developed in Rocket will conform with the latest BWA standards, including 802.16m, which are now going through the IEEE (the international engineering standards body) approval process, and so will have a shelf-life of many years.

The main focus of the project, though, will be to expand the scope of relay coverage from the single hop of Fireworks — one base station to one relay station — to a multi-hop configuration with one or more base stations sending signals onto to relay stations which can then retransmit to other relay stations. This will require a lot more work on the base-band and protocol layer to ensure what could be several different signals being combined into the best possible signal for the end-user.

While the work being done is highly technical, the end result will simply mean high-quality, low-cost wireless broadband access virtually anywhere in Europe, and eventually the whole world.

Fireworks was funded by FP6 and Rocket by the Seventh Framework Programme (FP7).

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/BrowsingType/Features/ID=89924>



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Next-gen broadband at your service

Faster, smarter broadband networks are on the way, thanks to European research. The next step will be to usher in compelling services for European consumers. Already companies are eager to get their hands on the technologies developed by the EU-funded MUSE project.

The work of European researchers on the first phase of the MUSE project, funded by FP6, accelerated the deployment of faster broadband networks in Europe (see 'Europe's next-generation broadband' on *ICT Results*).

But the second phase of the project, which finished in March 2008, took the concept even further. It developed enhanced services and ensured that the product of phase I, the Global system for broadband (GSB), can evolve to keep pace with emerging technologies and services.

'We really went quite far in phase II, developing some very advanced systems, but many of them are already quite mature and ready for pre-deployment validation,' says Peter Vetter, coordinator of the MUSE project.

The list of achievements is impressive. MUSE phase II developed a solution to support fixed-mobile convergence, multimedia services like IPTV, or internet television. It developed an innovative and compelling 'network intelligence' and provided solutions for plugging services and service providers into a network.

It also pushed back some fundamental boundaries in both vDSL and fibre-optic hardware.

Fixed-mobile convergence means that people can access their broadband service from wherever they are or use just one device for their telephone and video calls. At home, it uses the fixed line network, saving money. Once you leave the house it switches to a mobile network.

'It is almost seamless. The picture might freeze for a frame or two, but you do not need to reconnect the call or to use a password or anything like that,' Vetter explains.

The improvements to IPTV are very sophisticated, too. 'The problem with TV over copper wire [the telephone network] is that you get bursty noise. That can result in lost frames or a frozen image. It is okay for data, because the system can just resend, but it is not good enough for video.'

So MUSE phase II developed intelligence in the access network. It is aware of the type of content being transmitted, and can retransmit lost data if required, before a viewer sees a problem.

They took the system further. 'Many of the IPTV services offer time-delayed viewing, where you can watch something after it is first broadcast. We know most people watch the most popular shows, like news, sport and soap operas, between half an hour and an hour after they broadcast. That can cause a lot of sudden bandwidth usage, slowing down the network.'

'So we developed a cache system in the access network, closer to the home. It saves bandwidth on the metro network. It is as if subscribers are given a free personal video recorder (PVR) or TiVo with their subscription, except the network stores the content instead of a hard disk sitting on your television and you do not need to programme it in advance.'

MUSE also developed an architecture for residential gateways. Right now, the residential gateway in most houses is simply a modem or a router, but in the future it will include servers and databases for storing content.

Cleverly, and very subtly, the MUSE gateway architecture also handles authentication, configuration, quality of service, increased security for the homeowner's services, and automated remote management so consumers should experience fewer problems when setting up a new service. It is a big plus to the system.

The project also developed various business scenarios with different service providers, whether the network owner, the internet service provider (ISP), a television company, corporate services, or even a combination of all these. Based on these scenarios, they worked on a variety of network interfaces, to

make the network solutions flexible for any of these deployment scenarios.

As if that were not enough, MUSE phase II also pushed back the technical limits on many of the technologies for broadband. They pushed vDSL technology in standardisation so it can achieve 100 Mb/s (instead of tens of Mb/s) and be more robust against impulse noise.

They pushed optical fibre, so it can carry 10 Gb/s, and extended its potential range, from 20 to 100 km. Right now, the fibre tree is split between 32 or 64 houses, but MUSE proved that it could be pushed to split between 500 or 1 000. In almost every area the project touched, it improved or enhanced the required protocols, software and hardware.

Unsurprisingly, industry is banging on MUSE's door to get at the results. 'There are a lot of companies working in bilateral arrangements to validate many of the technologies we worked on,' confirms Vetter. 'Intelligence in the access network, in particular, responds to current problems faced by the telecoms companies and service providers. I don't think it will be too long before some of these enhanced services are deployed.'

'Other areas are more long term, and work continues on almost every aspect of MUSE. But ultimately it will mean better broadband access and services for Europe. And the system is designed to evolve, too, so it should be able to keep pace with new developments.'

And that means Europe's surfers will get next-generation broadband, at their service.

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<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/BrowsingType/Features/ID=89916>



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Ghosts of aircraft monitoring

Congestion in the skies is an increasing element traffic controllers and pilots alike are having to deal with. Particularly at landing and take-off, congestion is critical, and an EU-funded research project has investigated several innovative means whereby the risks at these two points can be minimised.

Major international airports can see an average of two or three planes landing and taking off within the space of a minute. The coordination involved is difficult and requires great skill especially when tailing distances have to be taken into consideration. A smaller plane, for example, can have an awkward landing if following too closely behind a larger craft.



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To this effect, the Sourdine II project investigated user-friendly solutions for pilots and traffic controllers that assist in both the departure and arrival procedure. Part of the project's focus was to develop automated tools that could prove beneficial — a revamp of monitoring equipment and their use.

One such development involved user-friendly displays on the flight deck that would show two new aspects of in-flight conditions; a vertical navigation display and a flap deployment cue display. For flap and/or gear deployment cues, several problematic parameters were taken into account, including aircraft speed, wind conditions and time for cues to be selected.

The combination of onboard display, ground tools and monitoring aids were designed to improve the conditions involved in approach and take-off. For example, the ground control unit is based on a system of 'ghosting'. Ghosting refers to a visual display that predicts the flight path/position of an aircraft before it merges with other air traffic. In this manner, a controller may quickly and easily identify whether an aircraft is following too closely behind another aircraft.

In testing these tools, some shortcomings of the system were identified that will be addressed in further research and development. One example is whether or not a descent/approach pattern was initiated by the pilot in time. Because aircraft are following so rapidly one after the other, timing is critical, and further development of the tools could potentially eliminate this problem.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4298

Modelling turbulence in internal combustion engines

Research performed by the Consejo Superior de Investigaciones Científicas (CSIC) led to the improvement of understanding as to how turbulence is modelled inside the combustion chamber.

The transport sector, especially road traffic, is a significant contributor to carbon dioxide (CO₂) emissions and thus climate change. Europe has tightened its engine emission standards in an effort to combat this problem. In order to rise to the challenge, auto manufacturers must develop new tools focused on efficient engine design.

The LESSCO2 project aimed to provide a competitive advantage to the European automotive industry by applying large eddy simulation (LES) techniques to the internal combustion engine (ICE). The CSIC, a LESSCO2 partner, tackled the issue of turbulence at the inlet of the Otto four-stroke ICE.

During the 40-month project, the Spanish scientists managed to produce a synthetic

turbulent field that incorporated a non-reflecting boundary condition. The possibility of both numerical and physical wave reflection was therefore eliminated. In addition, the level of turbulence can be moderated according to user needs. Finally, but most importantly, the new LES method requires considerably less computing time and resources.

CSIC collaborated with another member of the LESSCO2 consortium to incorporate the new approach into the LES code AVBP. It should be stressed that this development is relevant not only to engine simulations, but also to other computational fluid dynamics applications.



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

Collaboration sought: further research or development support.

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Breaking news for the auto brake industry

Recent advances in coating light magnesium alloys have resulted in the development of an exceptionally reliable cast piston. The piston has already been applied in the braking system of commercial vehicles.

The invention of steel, and later on of stainless steel, has made it possible to construct long bridges and skyscrapers. The physical and chemical properties of this iron alloy, its hardness, ductility and tensile strength make it extremely useful. Steel is also widely used in the automotive and aerospace industry. Magnesium alloys have almost the same physical and chemical properties as steel. These alloys are much lighter however but are unfortunately corrosion susceptible.

The Nanomag project has succeeded in developing novel nanocomposite coating methods

for protecting magnesium alloys from corrosion and abrasion. With minimised corrosion susceptibility, all the benefits from the alloys' reduced weight can be fully exploited.

Elaborate plasma techniques were used for the deposition of protective coatings. Tarabusi, a Spanish Nanomag project partner, initially cast a magnesium alloy piston. Casting is a well-known manufacturing technique in which the magnesium alloy, in liquid form, is shaped by a mould. The cast piston was subsequently treated with keroneite, a hard coating, for corrosion and abra-

sion protection. The piston was then coated using plasma-assisted physical vapour deposition (PAVD) with a nitride layer.

Finally, the new piston was assembled in a reciprocating compressor in a commercial vehicle's braking system and extensively tested with over a thousand hours of running tests.

The automotive industry has a keen interest in magnesium alloys for mechanical parts. The use of these alloys results in production of lighter, less energy-consuming vehicles. The new piston is currently available for demonstration.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4235

Complex shapes made simple

There has long been a need to apply innovative techniques to industrial manufacture. This research set its sights on developing a new approach to the manufacture of complex-shaped parts and has succeeded by developing an optimal cutting strategy: one that is capable of driving down the costs of production.

Manufacturing complex-shaped engineering components is an important process for industrial production, especially within the automotive industry. Powder metallurgy is an industrial process which allows for shaping parts whilst minimising wastage and therefore reducing the costs of manufacture. This procedure however has a particular flaw — it is not capable of producing complex shapes without further treatment. In order to overcome this, careful machining procedures are needed to shape the heat-treated metal which consequently has become so hard that costly machines need to be employed. The PM-MACH project turned its attention to this problem. It developed new techniques for powder pressing,

clamping and machining procedures which mean savings all round.

Researchers in Switzerland developed an 'optimal cutting strategy' for milling powder metallurgy treated materials. This technology is capable of cutting complex shapes using right- and left-hand milling cutters and mills with cylindrical shanks.

The main idea is based around always starting by cutting, using the down hill milling method. The milling with the starting tool is interrupted and the tool is then changed. The second tool has the opposite orientation helix and its path finishes where the first terminated.

This cutting strategy can be used for complicated three-dimensional contours and uses minimum lubrication, which avoids high pressure coolant and also has the effect of being less harmful to the environment.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4268



Improved transport sustainability

The PRISM algorithm was developed to allow reliable chemistry modelling of engine flows with unprecedented gains in computing time.

Aiming to reduce green house gases and other pollutants emitted by automobiles, the LESSCO2 project focused on unsteady engine operation in Otto cycle internal combustion engines. Effective control of the cyclic variability in these engines can result in improvements in engine efficiency and pollutant emissions. Furthermore, cycle-to-cycle variations are considered responsible for limiting the operation range of novel concepts, such as controlled auto-ignition (CAI) engines.

Due to lack of suitable three-dimensional (3D) computer fluid dynamic (CFD) tools

unsteady engine phenomena have not been extensively explored. Urged by this the LESSCO2 project developed an innovative engine design tool for unsteady engine operation. The tool enables prediction of the effects of this operation on the energy conversion efficiency and the related pollutant emissions. More specifically, researchers adopted the large eddy simulation (LES) technique to include unsteady effects in the combustion chamber of engines.

One of the key project results involved the integration of realistic auto-ignition

chemistry into 3D CFD simulations. The PRISM algorithm offers 'intelligent' and fast chemistry tabulation by coupling automatic mechanism reduction with solution mapping. The method has been successfully implemented into a simple stochastic reactor model for engine knock simulation using a kinetic mechanism for mixtures of n-heptane and iso-octane. For further information on the project, please visit: <http://project.ifp.fr/lessco2>

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 > 4024

Humming a new tune

Low-emission combustion systems are a promising technology that suffer from the drawback of acoustic variations (sometimes called humming). This may lead to critical failures. Certainly, this drawback prevents their widespread use in various industries.

An EU-funded project, Muscles, looked into developing a more rotund understanding of the characteristics that play a role in combustion instabilities. Such factors as the rate of fuel vaporisation, fuel placement at the combustor inlet and the mixing process were assessed.

To do so, large-scale experiments were conducted on an industrial swirl-flow lean premixed prevaporize (LPP) burner. The reason for this investigation was to exam-

ine the complex interaction of vortices and the effect they — and flow recirculation in premixing devices — have on combustion instabilities. They were performed on different geometries of the radial inflow swirlers that had the same number of swirls.

Advanced swirl premixing LPP devices have inherent dangers to their use such as flashback and auto-ignition. It is hoped that the research will be developed into information on how such occurrences can be avoided.

Furthermore, the study also used numerical simulations that provide further insight into the complexities involved.

As such, the information gathered from the research will eventually be used in the near future as a tool in the design and development phase for fuel preparation systems. Currently no such modelling programme incorporates this element. The researchers are looking for further research and development support.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4265

Taxi over the river

A new mode of individual public transport, the water taxi, has been developed in Rotterdam.



Rotterdam, Netherlands

The Nieuwe Maas, a river branch of the Rhine-Meuse delta flows through a densely populated and developed area of the Netherlands with many houses and industries along its shores.

In light of this, the 'Transport and environment alliance for urban sustainability' (Tellus) project has decided to optimise the river's use by designing taxi boats which can transport passengers

over the river. The water taxis operate at a maximum speed of 70 km/h and connect 30 landing stages. These two factors, combined with the lack of traffic congestion, make for an innovative and efficient mode of individual public transport.

The project is operated jointly by the city of Rotterdam and a private entrepreneur. Five boats were in operation the first year, with the intent to increase that number to 10 the following year depending on the market volume generated.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4264

Quieter, cleaner urban transport

A new filter system has been designed in order to lessen air and noise pollution in an urban public transport fleet.

In 2003, it was estimated that approximately 4 000 residences in Rotterdam, Netherlands, were suffering from road noise that reached as high as 65 decibels (dB). Therefore, in order to address this issue, the 'Transport and environment alliance for urban sustainability' (Tellus) project has introduced silent vehicles using hybrid techniques.

Some of their aims involved increasing the use of public transport, reducing congestion, noise and air pollution and also reducing traffic. An additional fundamental goal was achieving political and public awareness pertaining to impacts of urban transport systems. This took place in the course of various evolutionary changes marking the progression of cleaner public transport.

For example, when the project began, Rotterdam's bus fleet was comprised of 181 buses which were in EURO I standard and four buses with filters of EURO II and III standard. As a result, hazardous substances like dust, soot and nitrogen oxides (NOx) were being emitted. Such emissions have lessened since then; however, the transport sector remains a primary polluter. Therefore reaching compliance with national directives is paramount.

In order to do this, the entire bus-fleet was converted to EURO IV/V standard using the DNOx filter. The DNOx system consists of an oxidising catalyst, a particle filter and using low-pressure exhaust

gas. These efforts were done in the hope of reducing emissions and improving urban air quality overall. Moreover, the city of Rotterdam set up policies to lessen the volume of road noise.

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

Collaboration sought: joint venture agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4282



Electromagnetic forming shapes eco-friendly vehicles

A report has been published which highlights the preconditions for optimising the electromagnetic preforming operation on vehicle part quality. This is essential to the success of an EU-funded project which seeks to apply this process to the manufacture of lighter vehicles, an innovative and exciting step in the race to find more environmentally friendly cars.

Electromagnetic forming (EMF) uses high energy in a technique which allows the reshaping of metal parts. In this EU-funded project taking the process name, EMF, the technique has been developed to be used on both tube and sheet metal.

Its application has been designed to be used directly by the car industry. It is expected that reducing the weight of vehicles (by applying the process to the metal automotive parts), would lead to a reduction of CO₂

emissions. This would enable modern car production strategies that are geared toward designing more environmentally friendly cars at no extra cost to the manufacturer or the consumer.

As part of this project, a report has been published which focuses on the influence of material and process parameters on part quality. It is an important precondition for this project's success that an evaluation is carried out which tests the effectiveness of electromagnetic performance on the process parameters, how they influence the forming process as well as the forming result.

In this evaluation, scientists focused on the following EMF processes: firstly, on the compression of tubular work pieces, and secondly, on the forming of sheet metal. Various investigations were carried out, which resulted in discussions centred on five central themes of concern to the scientists. They began by looking at the current pulse used in the process and the pressure which is defined by the pressure maximum and duration of the pressure increase. Analysis also focused on pressure distribution and the workpiece deformation and finally discussion turned to the subject forming velocity.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4246



Measuring high standards

One of the main indicators of a well structured and legally competent economy is the accreditations it uses to establish standards for the goods and services it produces and consumes. It is also important that these standards are maintained and enforced by inspections.

The LVD project aimed to prepare the EU Member States that joined in 2004 to meet European metrology standards. In order to push these new states forward, so they are better prepared to accommodate European standards, it was important that metrology requirements were met. EU directives exist which establish measurement standards that need to be implemented on a national level. According to the ISO/IEC 17025 standard, availability of traceable measurement and reference standards are essential. Testing removes the risk of uncertainty and is essential to assuring the quality of a product.

A strategy has been designed to achieve this, put together by scientists based at the Univer-

sity of Ljubljana, Slovenia. The strategy has two main strands. Firstly, to increase the visibility and efficiency of measuring and testing labs, and support their creation in countries which have not relied upon them up until now. Secondly, to improve industry relations with regulatory bodies in order to create an environment that is more responsive to the need for national regulatory standards.

The strategy accounts for the implementation and design of physical and chemical measurements that cover the most important sectors in a national

economy, industry services and defence. It was envisioned in the plan that accreditation bodies and inspection services would be put in place which can uphold national safety standards and legal requirements.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4401



Health and safety standards for Estonian citizens

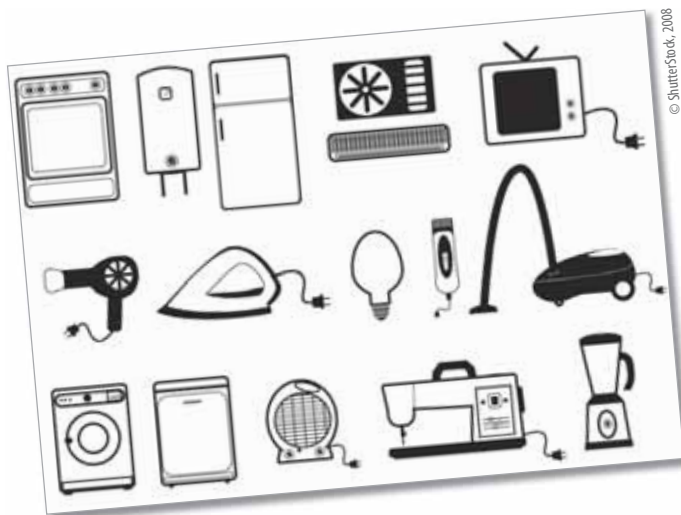
In order to promote long-term economic growth in the EU Member States that joined in 2004, health and safety standards must be met. In order to promote this in Estonia, an information campaign was carried out prior to the country joining the EU which was channelled to both manufacturers and consumers of electrical appliances.

In Estonia prior to EU accession, there existed a knowledge gap concerning EU health and safety standards and how these standards must be applied to the market for electrical appliances. Under the supervi-

sion of the Estonian Ministry of Economic Affairs and Communications, an information campaign was implemented. This campaign conveyed the message to consumers and manufacturers that in the EU, strin-

gent health, safety and environmental standards exist which must be conformed to.

The LVD project directed its efforts to producing information leaflets for the attention of consumers of electrical appliances. One of the leaflets outlined the significance of CE marking,



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which details what the mandatory conformity mark entails for consumer safety. A second leaflet was published which gave information on electrical safety at home. These were distributed in more than 100 shops and shopping centres in six Estonian towns. They were also put up on various related websites.

Another communication initiative was the publication of an implementation guide for the EU's Low Voltage Directive (LVD), for the attention of manufacturers and importers. The LVD seeks to ensure that electrical equipment within certain voltage limits both provides a high level of protection for European citizens and enjoys a single market in the EU. The directive covers electrical equipment designed for use with a voltage rating of between 50 and 1 000 V for alternating current and between 75 and 1 500 V for direct current. The guide was distributed through many channels including the Labour Inspectorate, industry magazines, the Electrical Safety Controlling Centre and other relevant bodies.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4402

Improving passenger comfort on ships

Motion sickness standards are based on studies which are 25 to 30 years old, yet ships have become more high-tech. It is time that passenger well-being standards take the front seat.

Motion sickness affects many passengers when they travel, causing them to experience dizziness, fatigue and nausea, altogether contributing to an unpleasant experience when they travel by ship. When assessing the possible criteria for comfort standards and the overall well-being of the passenger, this needs to be taken into consideration. This research, performed by the German Classification Society, sought to assess the up until now unexamined factor of low-frequency whole body vibration when on board. From this, a comprehensive categorisation of comfort criteria could be composed.

The investigation made up part of the Compass project. The project's main aim was to update research carried out on motion sickness in line with today's standards and the advancements in the technology used on ships. As it stands, passenger ships designed to be able to operate even in adverse weather conditions are not operating to their full capability. This is because they are not able to meet acceptable standards for pas-

senger health and safety all year round. The European shipping industry as a whole would therefore benefit from the project's goal, which was to develop a motion sickness prediction model dedicated to passenger comfort on sea transportation.

The report stated that there are five categories of comfort criteria that can be controlled. These are: accommodation design, lighting, noise and high- and low-frequency whole body vibration. Low-frequency whole body vibration is caused by ship motions and, as well as causing discomfort for passengers, also causes degradation of motor tasks.

Recommendations made acknowledged that it is in the interest of consumers for

there to be an established standard to measure their well-being. The standard needs to be based on rational criteria for human comfort, which serve to establish guidelines for rule development and make way for specifying rating levels of acceptability. These standards could be based on categories of passenger motion comfort, defined on a scale of: pleasant, acceptable and uncomfortable.

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

Collaboration sought: information exchange/training.

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Testing the bond strength of ships

The introduction of adhesive bonding will revolutionise modern shipyard manufacturing. Extensive tests in harsh marine environments have confirmed excellent operational performance of adhesively bonded joints.

Ship production costs will be substantially reduced because of the widespread use of adhesive bonding. Joining together light-weight materials with adhesives instead of bolts and screws is not only economical but proves to be safer as well. The Bondship project has focused its research on the design, construction and study of the structural behaviour of such bonded joints.

An aluminium-framed superstructure presented by project partners VT shipyards was used to implement a test programme. For a variety of bonded joints a thorough assessment of failure and fracture modes was performed. Strength tests were conducted under multiple operating conditions. The objective was to monitor long-term performance in a marine environment.



Static tests were performed on both standard single-lap shear specimens and butt strap joints. Fracture energy was measured with the aid of double cantilever beam test specimens. Shear stress was tested under both ordinary but also degraded environmental conditions. Humidity and high tem-

peratures simulated the harsh conditions. In these cases a strength reduction of up to 30 % was observed. Adhesive thickness is also an important parameter that critically influences specimens' strength. For four different thicknesses, strength evaluations were conducted and corresponding failure modes investigated.

Tensile strength and flexibility have been assessed with the aid of a four-point bending configuration. The tests revealed a weaker bond in the case of steel. A stronger bond is realised with aluminium.

For large bonded structures, evaluation of damage tolerance is necessary. Again, with the aid of double cantilever beam tests, failure at fracture was observed.

The developed methods for assessing bonded structures will greatly benefit ship building. Lighter, faster and cheaper ships and crafts can now be manufactured.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4160

In search of machining solutions for the micro-world

Modelling the actual microstructure of engineering materials can be a tedious task exposing many unnecessary details. Nevertheless, this may make it possible to predict the influence of forming processes on their macroscopic structure and be included in the design of more advanced micro-machining technology.

Requirements for miniature components are continuously increasing for manufacturers that continue to chase efficient machining solutions. The biomedical industry, for example, thrives on developing the least-invasive devices for surgical applications. On the other hand, industries as diverse as micro-electronics and aerospace demand complex, smaller components made from exotic and difficult-to-machine materials. As manufacturers strive to meet the increasingly tight tolerances of components that are becoming smaller, the use of conventional forming processes leads to damaging miniature materials.

Within the Machmini project, new definitions of plastic deformation characteristics of miniature materials were formulated to support modelling of forming processes. Considering both grain size and surface effects that are more pronounced than in bulk mater-

ials, a microstructural model of a single crystal was used to predict the behaviour of elementary volumes. The model was developed by project partners at the Société lorraine de services informatiques, France, and implemented in the finite element code ABAQUS®.

More specifically, mechanisms of plastic gliding observed in the laboratory on slip systems of well-defined geometry formed the basis of the user material (UMAT) subroutine formulating the model. Among the model's internal variables, the dislocation densities were calculated for each slip system. On the other hand, simulations of simple tensile tests performed on thin metal sheets offered a better understanding of observed dislocation. As metal sheets were pulled, their response to the forces applied revealed the role of the grains' relative dimension and position with respect to the free surface.

These theoretical results allowed the Machmini project research to be oriented towards an improved design of forming equipment incorporating piezo-activation to effect controlled deformation of miniature materials.

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

Collaboration sought: marketing agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4215



Improved fault detection in wastewater treatment

The build-up of nitrates in wastewater treatment facilities requires constant monitoring in order to prevent it from clogging the system. Nitrates remain a difficult element to trace as a number of various factors can lead to its build-up. An EU-funded project has developed more effective monitoring tools and control systems to tackle the problem.



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FDI-fault detection and isolation methods previously in use for nitrate build-up suffered from drawbacks such as sensitivity, and the lack of diagnosis of faults in the DO_x system and the requirements of sequential batch reactors. Improvement of such technology is especially welcome in urban areas, specifically wherein industrial outlets play a major role in the pollution of wastewater systems.

The EOLI project set out to better understand the technical issues involved, for which they then provided workable solutions. Initial results showed that variations in temperature and sensor calibrations affected diagnostics accuracy and these were additionally compounded by the fact that differing electronic equipment were used throughout.

As such, operators had to manually initiate testing which introduced further drawbacks.

Within the environment, the lack of standardised online data proved to be another barrier. Therefore, another essential task was to standardise the online data, and in so doing reduce the amount of false alarms. Another area the research focused on was in the classifications of nitrate buildup. Using laboratory simulations based on respiration methods, it was shown that the developed features worked exceedingly well, producing a diagnosis accuracy of more than 95 %.

In doing so, the solution for effectively dealing with nitrate build-up can be said to exist in simple monitoring methods. Since nitrate build-up can occur through various means, these monitoring solutions should evaluate the corresponding processing signals in order to provide operators with an idea of what conditions exist that could result in nitrate build-up.

While research is still needed, the accomplishments of the project indicate much improvement and should go a long way in improving water management decision-making.

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

Collaboration sought: further research or development support.

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Finite element contact and friction analysis

A European network of over 120 organisations specialised in finite element analysis has been established. Within the FENET thematic network the development of new advanced contact benchmarks has been initiated.

Finite element analysis is a well known and widely used computer simulation method used in engineering analysis. Many engineering problems, like friction between two surfaces in contact, are expressed with analytically unsolvable equations. Moreover, not only are the resulting equations partially differential but also involve parameters that need to be empirically or experimentally determined. Friction coefficient is one such example.

Despite the numerous industrial applications of finite element technology, its usage within the various industrial sectors varies considerably. In order to facilitate exchange of knowledge and experience between these sectors, the European Commission has funded the FENET thematic network. The network focused on the technology areas of durability and life extension, multi-physics and new technologies and finally, product and system optimisation. With over 120 organisations as members, the network represents eight industrial sectors in total like

aerospace, civil construction, biomedical and consumer goods.

The FENET project has conducted the largest ever independent international survey on the use of finite element technology, with over 1 300 responses. Additionally, network members met annually in order to promote best practices and address the difficulties experienced by finite element users.

Within the FENET network, a small working group has specifically addressed contact modelling problems and limitations of available finite element software. It has also looked for new ways to expand further the application of finite element methods. The FENET working group has established a new and

advanced set of benchmark contacts, namely two-dimensional contact of cylindrical roller, three-dimensional punch, sheet metal forming, loaded pin and steel roller on rubber.

The work group has published a contact benchmarks report that can be found at: <http://www.fe-net.org>

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

Collaboration sought: further research or development support.

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Suspending dust particles with water droplets

A new method for binding dust particles caused during demolition of residential or industrial buildings as well as bridges and industrial plants has been developed.

Blasting and explosive demolition of buildings can bring about a great amount of dust that is harmful to people and animals and damaging to technical installations. Such problems can be especially serious in demolitions occurring in urban centres. Due to the elevated social, economic and environmental costs, there is an urgent need for efficient preventive dust suspension.

In answer to this, the Exhode project has developed the explosive hose system, a new method for binding dust particles that uses less water than conventional methods. Hoses filled with water and containing blasting cords are set up

in the vicinity of the building. The hoses are set off shortly after the blasting occurs. Since the water is dispersed in the form of minute droplets, it is able to retain the fine and very fine dust particles which are caused by the demolition.

The explosive hose system has the potential to improve air quality for residents near blasting demolition sites. The system may also be used for abatement of dust, asbestos and toxic gases in mining, quarrying, tunnel construction and demolition industries. Prototypes of the explo-

sive hoses have been validated in a broad range of field tests. Commercial and technical documentation is available.

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

Collaboration sought: marketing agreement.

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High-temperature but low-cost stress test

In a number of industrial processes, many components and appliances need to operate at elevated temperatures. A stress test has been developed that will be used extensively by companies that maintain electronic systems at high temperatures.

In the automotive, as well as oil exploration and aerospace industries, electrical circuits and electrical equipment are very often exposed to high temperature environments. Operating at these high temperatures requires novel materials and well controlled processes.

The ATHIS project has demonstrated elaborate and advanced techniques that are required for manufacturing distributed electronic systems with high reliability in high-temperature environments. Working temperatures often exceed 200 °C and system failure may easily occur. This is especially critical for safety systems that must operate constantly and reliably.

The ATHIS fabrication techniques ensure fully functional system operation.

The low-cost and high-temperature stress test is a successful example of the fruitful approach followed by the ATHIS project partners. It is an intelligent 'burn in' system, capable of continuously simulating devices with functional test patterns. The devices are subjected to high-temperature stresses over prolonged periods of time. Their response is continuously monitored.

The test system includes an analog and digital waveform editor, capable of designing the test patterns and both functions can then be tested. Current ratio measurements

can also be performed. Furthermore the system is capable of memory tests, scan testing and analysis of high temperature test runs.

The stress test can easily be applied. It is flexible and performs reliability tests and detailed failure mode analysis. The analysis, a comprehensive description of material at the point of failure, guarantees that safety regulations and standards will be strictly adhered to.

High temperatures can be harsh on electronics. Companies that manufacture or use devices will greatly benefit from the innovative low-cost stress test.

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

Collaboration sought: further research or development support.

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See also page 15 (offer 4276)

Coating technology brings industry up to scratch

In the bid to design coating technologies and environmentally friendly deposition techniques an EU-led research team based in Germany may have found the answer. They have developed a new carbon/carbon multilayer system which is wear resistant. This may be the coating technology the car manufacturing industry has been searching for.

The carbon/carbon multilayer is a coating that has been designed to protect metallic surfaces from wear. It also acts as a buffer, to reduce frictional force under tribological loading. This refers to the science and the technology of interacting surfaces in relative motion and is associated with friction, lubrication and wear.

This solution is part of a drive to bring European suppliers of car parts up to date with their Japanese counterparts. Piston

ring manufacture in Japan already involves the process of coating. European suppliers also need to develop new technical solutions in order to comply with new emission laws. A suitable solution would be able to be used for widespread mechanical applications such as gears and car engine components (cylinders and tappets).

This new coating technology has been part of the Nanocoat EU-led project. It consists of a nanostructured amorphous coating, con-

sisting of 100 % carbon. The layered nanostructure is obtained by periodic variation of chemical bonding state (sp-hybridisation) between carbon atoms.

The coating technology can be applied by vacuum-arc from graphite sources in specific coating machines. A technique for this application was also developed as part of the project. It involves using a pulsed arc to deposit a film of the coating material with a thickness range of 100 nm up to 10 µm.

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

Collaboration sought: information exchange/training.

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