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Sustainable economy

The world economy is currently in a crisis, some say the worst since the Great Depression of the 1930s. As one of its key players, the EU has not been spared by these financial woes. Yet, first lessons are already being drawn and they spell good news for many, including those in the scientific community. There is talk of a resurgence of the so-called 'real economy', based on manufacturing and industry. The research*eu results supplement *presents an overview of how scientific research can play a part in developing future applications for industry, thereby contributing to solve the crisis.*

The lead article of this issue's biology and medicine section deals with the diet of sheep and the impact it has on our own health. The Biocla project has studied the ideal feeding regimes of sheep to maximise the content of certain acids that are thought to reduce cholesterol and protect against cancer.

The energy section opens up with an article on the use of dimethyl ether, an alternative fuel, to power trucks. The Afforhd project has studied this revolutionary fuel that can be made from natural gas or from biomass, thereby reducing CO_2 and eliminating soot emissions.

The environment section highlights an increasingly recurring problem, the degradation of Europe's cultural heritage due to pollution. The Biobrush project studied the use of bioremediation techniques to slow down the process.

In the IT and telecommunications section, the lead article focuses on tomorrow's science education techniques in classrooms. The aim of the 'Lab of tomorrow' project was to bring students closer to their future everyday working environment, through the use of emerging technologies.

The industrial technologies section opens up with an article on recycling glass and carbon fibres. These materials are being used more and more in the manufacturing of vehicles to reduce weight and the REACT project studied the best methods to recycle them.

As of this issue, a new events section has been added, offering readers a selection of upcoming event announcements in the field of research. This new section will present a summary description of these events, including relevant website references.

Your comments on the research*eu *publications are always welcome. Please address questions or suggestions 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.

More info on the technologies presented? Search CORDIS!

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TABLE OF CONTENTS

Sheep feeding regimes give healthier milk

Conjugated linoleic acids (CLAs) are recommended in the diet for their anti-oxidant properties. Researchers in the Biocla project have investigated optimum feeding regimes for sheep to maximise their content in the milk.

Protection against cancer and lowered cholesterol are among the acclaimed benefits of CLAs in the diet. Health supplements are an obvious source but it would be undeniably better to enrich the diet with natural sources of the fatty acids. Meat and milk products are rich in CLAs and the EU-funded project Biocla has researched into how to improve the content in dairy products through husbandry and diet.

Italian-based project partners at the Istituto Zootecnico e Caseario per la Sardegna (nowadays named Agris Sardegna, Dipartimento per la Ricerca nelle Produzioni Animali) focused their research on feeding regimes of sheep and their effect on the CLA content of the milk. The diet of sheep relies mainly on pasture grazing as rearing is largely outdoors. However, supplements can be provided when pasture is sparse and the team allowed for this in their tests.

The trials were designed to measure the effects of two main factors. The first factor was the composition of pasture, especially with regard to presence of Mediterranean forage plants such as legumes like burr medic or *sulla*, and *asteraceae* like chicory or garland. The concentration of CLA precursors vary in relation to forage species and stage of growth and this can be determined by time of the season and grazing intensity. Secondly, the effects of supplementation were measured.

Overall, the results of the trials showed that there is a direct relationship between the amount of green herbage and CLA content in the milk. Concentration of CLAs in the milk is higher in leafy growth so grazing at medium to high intensity in spring was recommended to defer flowering.

At times of the year, when CLA content is low in the forage, the trials indicated that supplementation with fat-enriched additives could be effective. However, the scientists noted that sensory properties and shelf life of the resulting dairy products must be more deeply assessed in further trials.

For sheep farmers the important message is that with good husbandry, the quality of sheep milk can be improved. Feed manufacture companies and the dairy industry overall all stand to benefit from the fact that sheep milk and cheese can be marketed as a truly functional food.

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 > 4158

Effect of vaccenic acid on conjugated linoleic acid plasma

Conjugated linoleic acid (CLA) is a naturally occurring component of milk fat and is associated with a number of health related benefits. The Biocla project is part of an initiative to develop foods enriched in CLA for consumers.

A number of studies have been published which indicated that trans fatty acids (TFAs) in dairy products can have a detrimental effect. This effect is even greater than with saturated fatty acids (SFAs). This is because they increase 'bad' low density lipoprotein (LDL) cholesterol, which at high levels can initiate cardiovascular disease. Furthermore, they can decrease 'good' high density lipoprotein (HDL) cholesterol which can help protect against heart disease.

Studies have also pointed to a mechanism by which trans and saturated fats may influence high levels of cholesterol in the blood. TFAs can be formed during industrial processing in the hydrogenation of oils. They may also be found in animal fat as a result of a series of enzyme reactions in the rumen. There are however, major differences between TFAs in the two different types of fat. A major product of the enzyme reactions in biohydrogenation is vaccenic acid, which becomes rumenic acid.

The Biocla project studied how vaccenic acid present in CLA-enriched cheese affected CLA plasma levels in human beings. The results indicated that vaccenic acid significantly contributed to CLA plasma levels.

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

Characterising scaffolds for bone tissue engineering

A complete and reproducible method for physico-chemical characterisation of scaffold porosity and biodegradation has been developed to be applied on bone and other tissue engineering projects.

Tissue engineering has become very popular in medicine, particularly in the area of bone repairs. Advanced materials are used in bone reconstructive surgery for correcting bone defects or filling bone gaps in order to improve the clinical situations in which bone grafting is performed. Their use involves several benefits including less traumatic surgery and shorter healing times, as well as reduced risks and costs. Affected patients can vary from those diagnosed with bone cancer to those with high impact trauma or cranio-facial defects.

Urged by this, the 'Tissue reactor' project combined innovative technology and strategies from materials science, medicine, biotechnology and bioengineering to develop an innovative process for producing engineered connective tissue. Based on a perfused fixed-bed bioreactor system, a continuous cultivation process offers large quantities of three-dimensional tissue cultures. These are combined with capillary-like pre-vascular precursors to form in vitro tissue constructs that may be subsequently used as tissue substitutes in vivo.

Three different types of scaffolds were used that were based on polymers, calcium phosphate ($CaPO_4$) ceramics or both. One of the project partners, mnemoScience GmbH studied these scaffolds in terms of their chemical composition, thermo-mechanical properties, structure and in vitro degradation behaviour. The characterisation techniques were optimised and standardised in order to become reproducible, fast and inexpensive for a limited number of samples.

The standardised system provides an objective overview of the materials' properties and the quality of the scaffolds. Its adoption can promote the application of safe materials and minimise the risks associated with materials' defects. Apart from bone, the system could also be applied on other tissue substitutes and generally, on porous cell carriers. Potential end-users include scaffold manufacturers and users of scaffolds within the biotechnology and biomedicine sectors.

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

Collaboration sought: further research or development support.

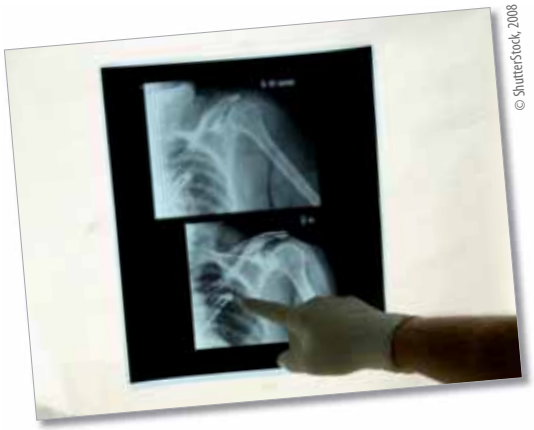
http://cordis.europa.eu/marketplace > search > offers > 4052

Another step towards making perfect bones

The generation of compatible bone tissue in vitro for a successful transplant is a major medical accomplishment. European researchers have developed a bioreactor system for optimised culture of tissue-engineered bone.

Bone is an ingenious product of evolution. There are different types of bone according to the location and function within the skeleton. However, the basis for the structure is a hard inorganic framework made up of primarily calcium and phosphate interspersed with canal and spaces for the living element of cells and blood supply. Through the reduction of the extent of the bony element and increase in spaces for the organic component, the properties of bone are varied in terms of strength and elasticity.

The objective for researchers then is to create an environment where the living component of bone in terms of cells and vessels can develop on and within a scaffold in a dynamic and controlled environment. As bone is a living tissue, the reactor vessel developed must supply a constantly controlled and monitored supply of nutrients, oxygen (O_2) and waste removal system. It is also necessary to satisfy the requirements for physical variables like ion and pH levels.



Project partners in 'Tissue reactor' set about to devise a culture environment based on a perfused fixed-bed reactor system. The objective was to produce large quantities of engineered bone tissue material on a continuous basis to transplant in vivo to the patient.

Consortium partners at Meredos GmbH in Germany designed and tested one such system for which they applied for a patent. They defined the critical shape of the reactor in order that constraints like perfusion to all elements could be satisfied. The system is modular and miniaturised. Supply of dissolved O_2 and pH probes have therefore been located externally. Also, for when small volumes of material are required, small flow rate measurement and peristaltic pumps have been downscaled and peripherised to the main reactor.

The modular nature of the vessel with these features means that the reactor is an economic, flexible means of producing engineered bone tissue material. This could revolutionise bone surgery which is high priority medically throughout the world, particularly in ageing populations.

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

Collaboration sought: further research or development support.

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Optical sensors make magnetic resonance imaging scans safer


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Magnetic resonance scans will be safer for children and other patients needing anaesthesia, thanks to new kinds of optical sensors developed by a team of European researchers.

Magnetic resonance imaging (MRI) is a powerful, non-invasive way of obtaining detailed internal images of the human body. Unlike x-rays, MRI does not use ionising radiation but probes the inside of the body with strong magnetic fields. It has become an indispensable aid to diagnosis and treatment.

But for some people, the experience of MRI can be upsetting. The patient must lie motionless for as much as an hour or more within the tunnel of the MRI machine. Children, especially, can find the experience frightening and the solution is to calm them with sedative or anaesthetic drugs.

'Anaesthesia for MRI examination uses the same drugs as anaesthesia for any surgical procedure,' says Dr Mathieu Jeanne of the Centre hospitalier régional universitaire de Lille, one of the partners in the EU-funded Ofseth project. 'Even if spontaneous respiration can be preserved most of the time during anaesthesia, it is constantly at risk of being impaired by anaesthetic drugs or by upper airway obstruction.'

As the anaesthetist cannot accompany the patient, it is essential that the patient be monitored remotely from the neighbouring control room. Unfortunately, the magnetic fields can interfere with electrical equipment, meaning that conventional electronic sensors cannot be used while patients are having their scan. There is also a risk of burns from electric currents induced in metal components by the strong magnetic field.

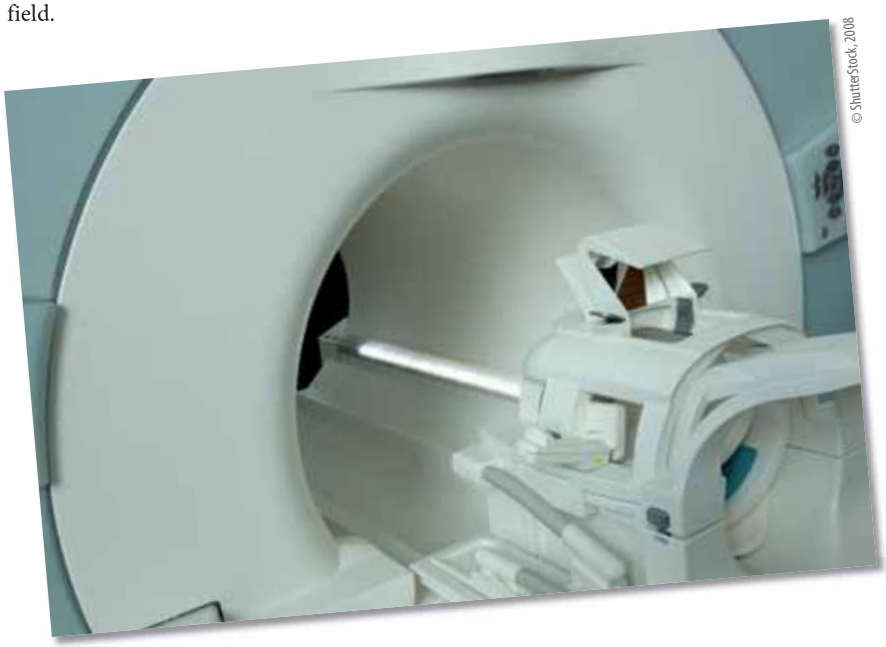
One solution, being pursued by the Ofseth project, is to use optical sensors and optical fibres. With no metal parts, optical sensors transmit information in the form of light pulses and are not affected by magnetic fields.

Ofseth is developing wearable textiles that incorporate optical monitoring systems. The partners are concentrating on systems suitable for children between one and five years old that will monitor breathing, heart rate and the amount of oxygen (O_2) in the blood.

'The light-guiding properties of an optical fibre can change depending on its surrounding environment,' explains Dr François Narbonneau of Multitel, an independent research centre based in Mons which is coordinating the project. 'By measuring the constraints applied to an optical fibre or by analysing modifications of the signal properties transmitted in an optical fibre, it is possible to measure a lot of parameters.'

Optical fibres are sensitive to being bent or stretched as this affects the amount of light they transmit. To monitor breathing, the researchers wove a plastic optical fibre into an elastic bandage to be placed around the chest or abdomen. It expands and contracts as the patient breathes and two types of sensor detect the strains in the fibre and so monitor the breathing rate.

The team have also designed a non-invasive blood O_2 sensor that compares the absorption of red and infrared light to gauge how much O_2 is present in the blood. The sensor fits on a fingertip and detects reflected light from the skin. It measures pulse rate as well.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Although other non-electronic devices can be used to measure vital functions, they can be cumbersome and expensive. And while optical technology is already in use for MRI monitoring, the patient often needs to be switched between two or three different systems as they are moved between different parts of the hospital.

The system developed by Ofseth avoids the need for such changes by incorporating the sensors into a garment worn by the patient. Plastic optical fibres are particularly suitable for such applications as they can be woven into the fabric.

'The main innovation is to use optical fibre sensors embedded into textile during the fabrication process for medical applications,' says Dr Narbonneau. 'The key idea is to provide a garment which allows monitoring of the patient from arrival at the hospital until departure without changing or disconnecting the monitoring system.'

All the hardware components are now ready and the next phase is to integrate them into a prototype garment which will then be tested in clinical trials. The project is due to finish in August 2009.

The ten partners contributed their expertise on healthcare, optical sensing and textile technology to make the project a reality. The lessons learned can be applied to a much wider range of applications. For example, the team is already planning to use the same sensors to create baby clothes that can be used at home to guard against sudden cot deaths.

Ofseth is part of SFIT, a cluster of projects to develop smart textiles supported by the Sixth Framework Programme (FP6).

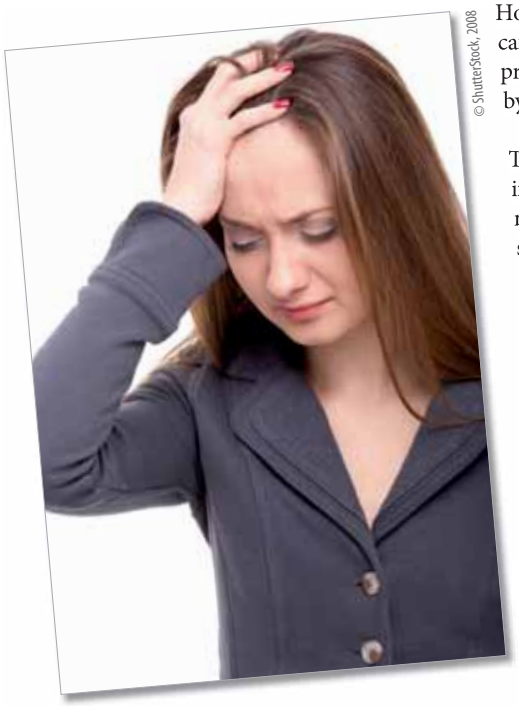
Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90019

Sour wine and headaches a thing of the past

Wine spoilage by lactic acid bacteria (LAB) causes not only a reduced quality product but may have dire health consequences. Scientists have developed a fast reliable test to detect the bacteria responsible.

Cheese and wine are natural table partners. Unfortunately, they share another link in that they are both prone to spoilage by tryamine producing LAB. Produced naturally in the body, tyramine is broken down by an enzyme before it causes cellular havoc. However, when an excess is ingested, it can leave the sufferer with a rise in blood pressure and increased heart rate caused by constriction of the blood vessels.



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The EU-funded project 'Decarboxylating pathways' set out to devise a speedy reliable test for the bacteria responsible. Previous to this new development, a plate test could be performed but it requires expensive equipment and takes up to three days for a result. Pathways involving the amine were studied and, on this basis, primers located in the appropriate gene to detect the amine producing LAB were developed.

The primers were screened using some 200 LAB strains to see if the tyramine producers could be detected. Techniques polymerase chain reaction (PCR) and high-performance liquid chromatography (HPLC) yielded exactly the same results. This therefore verified the effectiveness of the primers to indicate the presence of some very diverse LAB microbes. These included *Lactobacillus brevis* that also improves human immune function, notably against thrush infection.

Another amine not exactly desirable in wine is histamine, responsible for that headache and possible allergic reactions. The team also developed primers for this unwanted perpetrator of the wine bottle. The sensitivity of the resulting histamine test is very high and is able to detect spoilage microbes at a very low level (two histamine producing microbes per millilitre of wine).

Wine found with tyramine concentration above the recommended levels can be taken off the shelves. A decrease in the amount of wine unfit for the shelf has obvious economic benefits. A better, safer wine on the table, not to mention a reduction in that hangover, has undeniable appeal for the consumer.

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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Genetic control for the holes in your cheese

The production of a good cheese is dependent on many factors but naturally includes flavour and texture. European scientists have unraveled the complex biochemistry behind the cheese properties we tend to take for granted on a visit to the deli.

Milk is virtually a complete food for us and it does not end there. It is also a nourishing meal for bacteria that produce dairy products like cheese and yogurt. Texture of cheese is partly due to the production of carbon dioxide (CO_2) during fermentation which, on a big scale, makes the holes in cheeses such as Emmental. Linked to the same biochemical pathway is a molecule called diacetyl which gives the characteristic flavour in cheeses, buttermilk and Danish butter.

The starter molecule for these important features is citrate. Present in milk, it is cometabolised with sugars like lactose to produce diacetyl and CO_2 by lactic acid bacteria (LAB) like Weisella paramesenteroides. This little worker with the very elaborate name is common in a variety of foods. Under the umbrella of the 'Decarboxylating pathways' project, the team at Consejo Superior de Invetigaciones Científicas in Madrid researched these metabolic pathways to optimise the production of these end-products so important to the cheese manufacturer.

Using a strain isolated from an Argentinian cheese, the scientists focused the attention on a particular cit operon responsible for the production of cit messenger RNA (mRNA). In turn, this mRNA codes for enzymes responsible for the conversion of citrate into pyruvate. Pyruvate can then be transformed into diacetyl and CO_2.

They found that the instigation of this chain was catalysed by the presence of citrate. Low citrate it seemed would inhibit the formation of these enzymes and so slow down the breakdown of citrate. Absence of citrate also causes production of citrate permease which leads to the uptake of citrate when available in the cell environment. It is a neat little mechanism because once citrate is available the enzymes responsible for the cycle are produced. Moreover, it seems that this sort of mechanism is present in other LAB commonly used in the dairy industry.

Nucleotide sequences then can determine the size and quantity of holes in your cheese. Knowledge of these complex biochemical pathways then can produce the information the cheese industry need to produce the variety the consumer demands.

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

Collaboration sought: information exchange/training.

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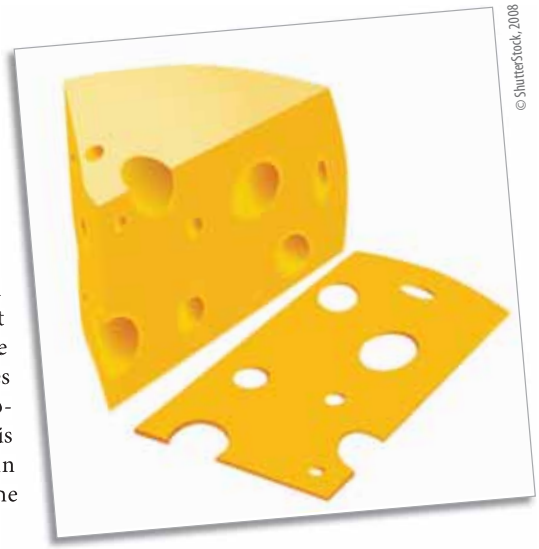

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Test for E. coli under field work conditions

Researchers identify* Escherichia coli (E. coli) *by studying the structure of colonies on plates of McConkey agar. However, this method is not specific enough, particularly if undertaken by poorly trained laboratory staff.

Around 10 % of *E. coli* are lactose negative and are not counted if a technique is used that only identifies lactose-positive colonies. In order to overcome these challenges the Antres project developed a simple and cost-effective procedure for identifying *E. coli* under field conditions.

The test detected the enzyme Beta-D-glucuronidase by using the substrate 4-methylumbelliferyl-Beta-D glucuronide (MUG), producing the compound 4-methylumbelliferone. A positive result was indicated by a strong blue fluorescence under UV light. Detection of the enzyme is important because it is produced by nearly all strains of *E. coli*. Furthermore, those other bacteria which produce the enzyme do not grow in the same sort of media as used for *E. coli*.

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The test developed by the Antres project was much cheaper than previous tests which use culture media which has had MUG added. The use of microtitre plates allowed a large number of strains to be analysed quickly and simply. The technique was found to be suitable for use under field conditions. One of the major benefits of the new method is that it greatly reduces the number of false positives obtained. The test enabled accurate identification of *E. coli* amongst lactose fermenting colonies.

During field trials in Bolivia and Peru the MUG-test was carried out for several coliform and atypical colonies. The result was a major improvement in the ability of local laboratory staff to classify isolates grown on plates of McConkey agar.

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 > 4173

The highs and lows of glycaemia from diet

A team of scientists from the European '13C-Starch' project have researched the metabolic effects of low versus high glycaemic index (GI) diets.

The GI of a carbohydrate food gives it a rating as to how rapidly it induces an elevation in blood glucose levels. For people suffering with type II diabetes, this can be crucial in fending off an unwelcome surge or drop in blood glucose levels. A Lyons-based team of scientists at the Centre of Research for Human Nutrition have investigated the effects of GI on other aspects of human metabolism.

In order to do this, they subjected two healthy overweight groups of people to two diets — one low GI (LGI) and the other high GI (HGI) to replace the starchy foods in their normal diet. The diets only varied as far as GI was concerned. Other parameters — calorie intake, protein, carbohydrate and fat levels were all identical.

At breakfast on the first day of the regime, glucose levels were monitored after the meal using 13C labelled food. Overall, total glucose from both exogenous and endogenous sources tended to be lower with the LGI biscuits than after the HGI cereal. However, more detailed analysis over the total diet period revealed a potentially different picture.

On the first and the last day of five weeks, the matched groups were monitored for a whole range of parameters that would reflect their glucose and lipid metabolism. These included their weight, glycaemic, insulinic and lipid blood profile, body composition and metabolism.

For glucose appearance, there was no difference between the two diets. The GI of the foods had no effect on total, exogenous or endogenous production of glucose. However, cholesterol levels had improved for the LGI group and they had also benefited from a loss of weight.

In a bid to clarify the complexities of glucose metabolism, this study can be used as a solid basis for further research. The main emphasis for the future is to determine the metabolic effects of the other components of the diet.

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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Targeting metastasis and invasion prevention

Through an integrated approach to cancer therapy, a system was developed which analyses inhibitors of interactions of G-proteins in their active, bound state.

The successful treatment of cancer demands the availability of appropriate therapeutic substances against a considerable number of targets. Cancer's progression from a normal to a fully tumourigenic phenotype involves the accrual of mutations in genes, which command cell function. The attainment of each tumour cell phenotype (immortalisation, transformation and metastasis) is related to particular sets of mutations. Therefore pinpointing mutated gene products which present each of the tumour specific phenotypes is a potentially effective anti-cancer method.

The 'Targets for cancer T' project found new target regions in areas where suitable therapies had been lacking. Top experts in structural biology, screening and design converged in search of lead molecules. They also identified and validated targets and leads through the use of mammalian genetics and mouse genes. In particular, they focused on G proteins which act as molecular switches between an inactive and active bound state, which can go on to regulate cell processes.

Previous studies were thus extended by investigating several new pathways and focusing on targets useful in preventing metastasis and invasion, specifically Ras- and Rho-family G proteins. A fluorescence resonance energy transfer (FRET) assay for in vitro and in vivo was developed. This was used to screen for inhibitors of interactions of these proteins in their active, bound states. Specifically Rac and CDC42 are able to interact with a fusion protein in which PAK residues were inserted between the donor and acceptor fluorescent proteins. This then elicited a recordable change in the energy transfer. Past research has linked PAKs to tumourigenesis in various organs.

Project partners also worked on other challenges facing research. Choice of compatible vectors with good levels of expression was a significant factor. The scientists also ensured that enzyme degradation of the unstructured linker region containing PAK did not occur.

Of particular importance was the possibility of using the FRET system within living cells. This shows its function in both intact bacteria as well as in mammalian cells. Although intact bacteria are easier to manipulate, allow high levels of expression and therefore could be used as a drug screen, mammalian cells are more appropriate in terms of cell permeability. Overall, the analysis could assist in propelling medicinal chemistry and pharmaceutical drug discovery.

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

Collaboration sought: information exchange/training.

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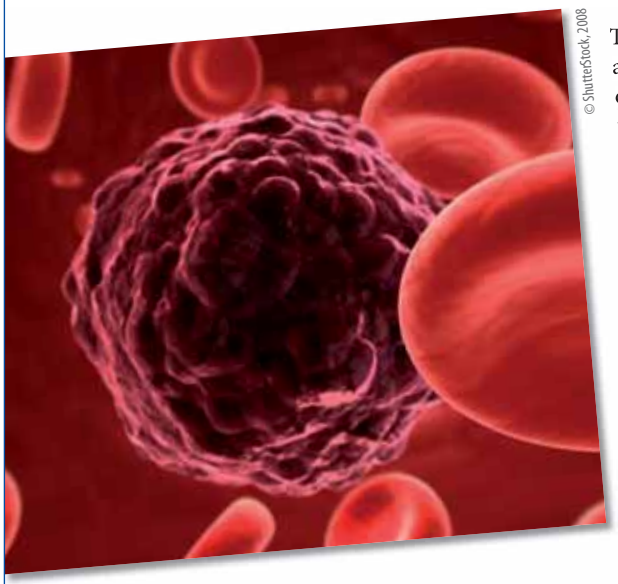
New strategies to prevent tumour growth

The creation of new blood vessels (angiogenesis) is an essential part of tumour survival. Preventing the process of angiogenesis can be an effective therapeutic modality against cancer.



The EU-funded 'Anti tumor angiogenesi' project focused on the signalling process which is necessary in the capillary formation in malignant tumours. Preventing the signals from being transmitted could mean that angiogenesis is halted and the tumour starved of key nutrients.

Researchers at the Medical University of Vienna made a series of observations regarding angiogenesis through a series of in vitro studies. The overexpression of the EGR-1 (early growth response factor 1) protein from adenoviruses prevented a series of angiogenesis steps such as sprouting and tubule formation. Furthermore, prolonged EGR-1 expression led to apoptosis (programmed cell death).

Analysis of this phenomenon indicated that EGR-1 induced these effects only when overexpressed and in fact low-grade expression leads to the induction of angiogenesis and proliferation. The overexpression mechanism is likely to initiate a feedback inhibition mechanism which eventually leads to a stop in angiogenesis.

This line of research forms part of a whole series of observations likely to lead to new insights into the control of angiogenesis in cancer patients.

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

Collaboration sought: information exchange/training.

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Frailty and falling in the elderly

A team of European scientists has investigated whether there are links between the frailty of the elderly and muscle unsteadiness. The efficacy of various training programmes was also evaluated.

Frailty has to be one of the archenemies of the ageing population. Not only does it cause injury and possible confinement in hospital, it threatens the independence of old people who may otherwise be healthy. The European 'Better-ageing' project investigated the factors involved in physical frailty and training programmes that may counteract this degeneration.

Scientists at King's College London specifically researched muscle weakness in healthy young and old people as well as an age-matched group of older people who fell for medically unexplained reasons. Using techniques including ultrasonography, variables such as maximal voluntary strength and activation, leg extension power output, steadiness and asymmetry of strength were measured. The relationship between number of falls and the different measures of strength could then be calculated.

There was found to be a strong correlation between frequency of falls and reduction in power. Interestingly, asymmetry of power did not predispose the elderly to falling. Furthermore, the group of age-matched fallers demonstrated more degeneration than would be expected for their chronological age.

As a preventative strategy, training and exercise programmes would seem an appropriate measure that could be implemented by physiotherapists and trained care workers. The scientists discovered that elderly fallers and non-fallers showed a similar response to a one-year training programme. This resulted in an overall increase of strength in various muscle groups. As an alternative, a trial involving the gentle workout of the martial art Ti Chi proved potentially beneficial for confidence and was found to promote the habit of exercise.

The findings of this study have been disseminated through a series of working groups that include the medical profession, health authorities and age-related charities. Training programmes that would prevent or reduce falling could be included in a scheme that would stop the instigation of a vicious circle of frailty and falling. This would then provide a significant contribution to the achievement of the European goal of healthy ageing within the population.

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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Effect of exercise on chest wall volumes

Chronic obstructive pulmonary disease (COPD) is a major cause of disability throughout Europe and the rest of the world. The CARED project studied the effect of exercise on regional chest wall volumes in patients suffering from this condition.

Chronic obstructive pulmonary disease is a serious health problem throughout the world. It is a disease of the lungs, which results in a narrowing of the airways. This causes the flow of air to and from the lungs to be limited, which leads to shortness of breath. Unlike asthma, the limitation of airflow is difficult to treat and the condition gradually worsens over time. The cause of COPD is inhalation of harmful particles and gases, usually from smoking.

This disease, along with asthma, causes chronic airflow limitation (CAL), which is a major cause of disability throughout the world. The disability results in a reduced quality of life for sufferers because of their inability to exercise and carry out normal daily activities. It is so severe that only 46 % of sufferers are believed to be in employment. Sufferers of COPD may not be able to completely finish breathing out before they take another breath. The amount of air remaining in the lungs increases during exercise. This build-up of air is known as dynamic hyperinflation and it is closely linked with shortness of breath.

The CARED project investigated dynamic hyperinflation in the lungs of COPD sufferers in an effort to discover how respiratory muscles respond to the changes in lung volume. It also aimed to determine which particular patients are affected. The team used optoelectronic plethysmography to measure total and regional chest wall volumes in 20 COPD patients, who were in a stable condition. Optoelectronic plethysmography is a non-invasive technique which calculates the enclosed volume through external measurements of the chest wall surface motion. Movement of air into and out of the lungs was measured while the patients were at rest. Breathing patterns, symptoms and rib cage and abdominal volumes were also recorded. Eight patients had their pleural, abdominal and transdiaphragmatic pressures measured.

The results showed that dynamic hyperinflation was not the only mechanism limiting exercise performance in patients with stable COPD. Different patterns of respiratory muscle activation during exercise were revealed following accurate measurements of chest wall volume.

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

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Disposable 'lab-on-a-chip' may save costs and lives

Low-cost, disposable cartridges that would let doctors perform diagnostic tests at the point of care could speed up diagnosis and treatment while lowering costs. European researchers are rapidly closing in on that goal.

Researchers in the European 'Surface enhanced micro optical fluidic systems' (Semofs) team knew that, to reach their goal of disposable cartridges capable of performing complex medical diagnostic tests quickly and at low cost, they would have to push existing technology to the limit.

'We are targeting state-of-the-art sensitivities or better,' says Jerôme Gavillet, the dissemination coordinator of Semofs, 'in a system that could be available anywhere for less than EUR 50.'

The team's goal is a polymer-based device the size of a credit card that would incorporate sophisticated technologies to control the movement of biological fluids, detect the presence of specific proteins, for example early signs of cancer, and analyse the results.

'For each patient, a physician would open the package, put some blood or serum on the card, let it work, and then connect it to a card reader,' says Mr Gavillet.

The relatively inexpensive card reader would display and record what the card had measured.

The EU-funded Semofs team says that it has made the greatest progress in two areas: microfluidics and plasmonics. Microfluidics involves materials and techniques for controlling the movement of minute quantities of fluids. The Semofs card moves blood, serum and other fluids through channels slightly wider than a human hair.

In order to control the movement of biological fluids through such tiny channels imprinted into the polymer card, the researchers developed ways to make the surfaces of the channels superhydrophylic or superhyrdrophobic.

Hydrophilic surfaces wet easily. Glass is hydrophilic, which is why a thin glass tube will draw water into itself via capillary action. In contrast, hydrophobic surfaces like Teflon® repel water.

The Semofs researchers used nanotechnology to structure the interior surfaces of the device's channels to make them far more hydrophilic than glass or far more hydrophobic than Teflon®, as needed.

The superhydrophilic channels guide the fluids to their destinations without the need for any kind of pump. In contrast, small areas with superhydrophobic surfaces act as valves, temporarily stopping the flow of a fluid until sufficient pressure is applied to force it through.

That added pressure comes from puffs of a hydrogen-oxygen gas mixture generated by an electric voltage directed to tiny chambers filled with a water-saturated polymer gel.

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'When you have a meeting point of two, three, or many channels, you may want to have sequential managing of different liquids,' says Mr Gavillet. 'It's like a railway — you make one train wait until another one has gone by.'

Once the biological sample and the fluids necessary to process it have interacted in the proper sequence, the device uses plasmonics to determine if proteins from the sample have bonded to the detecting surfaces inside the card.

Plasmonics utilises the properties of the gas or plasma of free electrons moving inside or along the surface of a conductor. The electron gas inside the Semofs detector resonates at particular frequencies when it is stimulated by light. When proteins bond to antigens on the detector surface, their presence forces a slight change in that resonant frequency.

The researchers found that, by carefully engineering a stack of conductive and dielectric layers, topped by the layer primed to bond with the target protein, they could push the device's sensitivity beyond current limits.

'The final objective is to reach one picogram per square millimetre,' says Mr Gavillet, 'i.e. to reach state-of-the-art sensitivity even on a low-cost disposable chip.' One picogram is one trillionth of a gram.

The final challenge the Semofs team faces is integrating the technologies they have honed into a single, easily reproduced card or cartridge. They plan to pack everything — light sources and dectector, waveguides, and the microfluidic system — into one polymer-based card.

The electronics that will read the cards and display the results will be a separate unit. They are working to finalise the card in the eight months before the FP6-funded project comes to an end.

The researchers expect that the technologies they have refined and integrated will prove useful not just in clinics and doctors' offices, but in other areas where inexpensive but extremely sensitive detectors are needed. 'There's a market anywhere you want to probe a liquid or a gas,' says Mr Gavillet.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/

Identifying genes affecting growth in Arabidopsis

The study of natural variation in the model plant* Arabidopsis *is a highly effective method of discovering genes. This approach was applied to the identification of genes responsible for growth in the plant.

The different traits found in natural plant populations can provide valuable information on genetic diversity for plant breeding. The Natural project studied growth rate in plants by using two populations of *Arabidopsis*. The research team identified the position on the chromosome of the genes that affected growth. Lines with near identical genes were developed for analysis of these sequences. The carbohydrate content of the leaves was studied to determine the relationship between this particular factor and growth rate. It appeared that growth was linked to the accumulation of transient starch.

The rate of photosynthesis in a wide variety of ecotypes was studied; ecotypes being genetically unique populations, which have adapted to their local environment. The rate of photosynthesis appeared constant in different ecotypes, except for one that possessed herbicide resistance. This resistance was most likely induced by human intervention.

Researchers investigated natural variation in *Arabidopsis* in order to reveal the genetic basis of accumulation of micronutrients, in the form of minerals. Antinutritional factors were also examined including phytate, the principle storage form of phosphorus in many plant tissues. The position of the genes responsible for the accumulation of phytate and phosphate, iron, zinc and other minerals was also identified.

The loci of the genes affecting the accumulation of phytate appeared to be different to those which affected iron and zinc. This suggested that it was possible to breed *Arabidopsis* for increased mineral content without interfering with the accumulation of phytate. Researchers also observed that when the plant was stressed as a result of cold or salt conditions, growth was severely reduced. However, it appeared that reduction in growth was not a result of altered carbohydrate metabolism.

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 > 4318

The effects of Microsporidia infection in bumblebees

The study investigated the effect of infection by* Microsporidia *on bumblebees and their colonies. The results will help the bumblebee breeding industry develop sound control strategies against the parasite.

Bumblebees are reared to aid in the pollination of crops. European companies supply the world market with this important pollinator. Some crops cannot be fully produced within the EU without the aid of bumblebees. In order to safeguard colonies it is vital to understand the causative agents of bumblebee diseases so that they can be properly controlled. It is crucial that the introduction of parasites into new areas or host species is avoided. Infection by *Microsporidia* often results in chronic debilitating disease in the host. It can cause reduced longevity, fertility, weight and vigour. The parasite can pass from the ovaries of the queen into eggs, eventually multiplying in infected larvae.

The 'Pollinator parasites' project studied the impact of the *Microspodia Nosema bombi* (*N. bombi*) on colonies of bumblebees. The project developed sensitive tools to detect the parasite. Spores were taken from adult *Bombus terrestris* (buff-tailed or large earth bumblebees) and administered to individual worker and queen larvae. The result was an infection rate of 13 % for queens. Following hibernation the founding rate of new colonies was 33 % for control queens. However, the founding rate for queens infected with *N. bombi* was only 4 %. In some queens the parasite could not be detected in the intestines. However, parasite DNA was detected in the ovaries by using molecular detection techniques developed by the project. This suggests transovarial parasite transmission, although this route of transmission still needs to be verified.

It was discovered that if a colony becomes infected at an early stage of its development virtually all the bumblebees become infected. Furthermore, spores were found in different tissues. The result was that the functional fitness of males and young queens was reduced to zero. The survival rate of infected males and workers was also greatly reduced. The effects were so severe that the transmission rate of *N. bombi* to the next generation were reduced. The results suggest that the parasite needs to infect colonies and/or queens that go into hibernation late in the season. If this is not the case parasite transfer to the following season will be impaired.

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 genetic path to nematode infection resistance

The safety of the food chain is a matter of urgent importance for the EU as a whole at a time of continuous health challenges originating from a variety of food stuffs.

The EU-funded Genesheepsafety project used a series of genetic approaches to ensure quality and safety of the sheep food product chain. Project partners specialising in different aspects of sheep breeding and physiology, and genotyping worked together to improve the quality traits of sheep-based products.

One of the specific areas that project partners focused on was the genetic characteristics of nematode resistance in the Blackface sheep population. These characteristics can be found as a result of what are termed quantitative trait loci (QTL), areas of genes responsible for specific characteristics.

The Roslin Institute collected data from 789 animals over a three-year period. The animals were exposed to nematode endoparasitic infection by grazing. Following genetic analysis, QTL evidence was identified on chromosomes 2, 3, 14 and 20.

Although not conclusive, these new studies are the strongest indication of the genetic involvement in nematode resistance in sheep. Validating these data in commercial breeds and developing marker panels was the subsequent step. Communicating the data back to the farmers will allow use of those animals with the more favourable genotype.

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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Nematode feeding cell induction

Prevention of nematode infection is receiving new attention following attempts to create plant strains with inherent resistant to infection.

The EU-funded Nonema project focused on the genetic manipulation of potato and tomato plants in order to engineer new strains with durable resistance to nematode infection. Part of the project focused on the understanding of the nematode life cycle and the molecular steps involved.

Researchers at the Wageningen University studied the role of a specific phytohormone, auxin in the induction of nematode feeding cells. Cyst and root-knot nematodes were used for the studies, which were conducted on *Arabidopsis thaliana* roots. Initial observations determined that at the early stages of inoculation the auxin-responsible gene promoter is highly upregulated leading to an increase in auxin concentration.

This increase in auxin levels continued post the initial 18 hours of infection until it levelled off after almost five days. The links between auxin increase and feeding cell induction in both nematode types is an interesting observation given the otherwise limited similarities between the two. Further examination of the auxin concentration increase during feeding cell induction and development could lead to important clues relating to efforts focused on preventing nematode infection.

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 > 4077

Assessing the role of pollution in inflammation

Air pollution has often been linked to health defects. Examining the impact of air pollution on human health is an important aspect in designing and implementing prevention strategies.

The EU-funded Airgene project monitored specific patient groups in six European cities over a period of eight months. The aim was to establish clear links between ambient air pollution and inflammatory responses. Project partners focused on the study of myocardial infarction (MI) survivors in Athens, Augsburg, Barcelona, Helsinki, Rome and Stockholm.

The impact of air pollution on the survival outcome was examined in combination with other factors such as genetic polymorphisms. In the past, ambient air pollution had already been implicated in increased risk of hospital admissions among MI patients. Based on this premise, the epidemiological study run within the Airgene framework aimed to investigate whether air pollution could and did trigger inflammation in MI patients.

Studies focused on the levels of pro-inflammatory cytokine interleukin 6 (IL-6) and the acute phase proteins fibrinogen and C-reactive protein (CRP). A total of 1 003 MI survivors were recruited and assessed with at least two repeated clinic visits without any signs of infections.

Further research into this area can provide insights regarding the role of genetic polymorphisms as well as air pollution on the susceptibility of MI patients to inflammation.

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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A clean alternative truck

Alternative transport fuels can provide Europe's urban areas with more energy efficient and environmentally friendly solutions. A newly designed truck fuelled by Dimethyl ether (DME) offers the option of low emissions and fuel consumption during optimum driveability.


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DME, a clean burning alternative, has been incorporated as the energy source for a new fuel system. It can be made from natural gas as well as from biomass which aids in CO_2 reduction and has no soot emissions. DME can be used in diesel engines as well as fuel cells making it more versatile now as well as in the future.

The Afforhd project, in collaboration with a leading R & D organisation and a subcontractor have designed, developed and demonstrated the potential of DME. Emerging integration issues were solved by incorporating the complete engine with the new fuel system, fuel supply and electronics resulting in a truck as the end product.


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Once the integration was completed, the overall system of the vehicle was tuned so that optimum drivability could be attained while keeping emissions and fuel consumption at the same level. Evaluating the vehicle's behaviour while operating on DME was of key importance in the experiment. Upon final tuning for field tests, the vehicle was checked through an Electromagnetic compatibility (EMC) test to avoid any driving problems related to interference of electromagnetic radiation.

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

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

http://cordis.europa.eu/marketplace > search > offers > 4358

Finding the price tag for alternative fuel

There is a lot of hype about new and alternative fuel sources. Whilst technological development in this arena races on, consumers, economists and investor interests are wondering how much it will cost the end user.

British Petroleum (BP), as a major international oil company, has now developed an innovative system to accurately determine the end costs involved in bringing alternative fuel to pumping stations. In order to calculate end-user figures, behind the scene costs would need to be evaluated. Aside from the obvious costs of developing new infrastructure for dimethyl ether (DME) rather than standard petrol, such issues as transport and shipping would also need to be considered.

For example, shipping costs would also need to incorporate the development of new facilities that could safely and surely store and transport DME to a European depot, and from there truck it to final outlet stations. Also, considerations such as size of storage and processing plants would need to be taken into account, as well as their location.

One such case study (as developed under the Afforhd project) placed a processing plant in Algeria. They based their calculations on a 1 500 km travel to a depot in Italy and then a 150 km road trip to a fuelling station, and predicted an end price of between 0.20 and 0.22 EUR/l.

Such figures were attained using liquefied petroleum gases (LPGs) as the basis (adjusted for the physical properties of DME), as their shipping, trucking and depot requirements are similar. It is to be noted that the predicted costs do not include surcharges and government taxes.

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

Collaboration sought: joint venture agreement, information exchange/training, available for consultancy.

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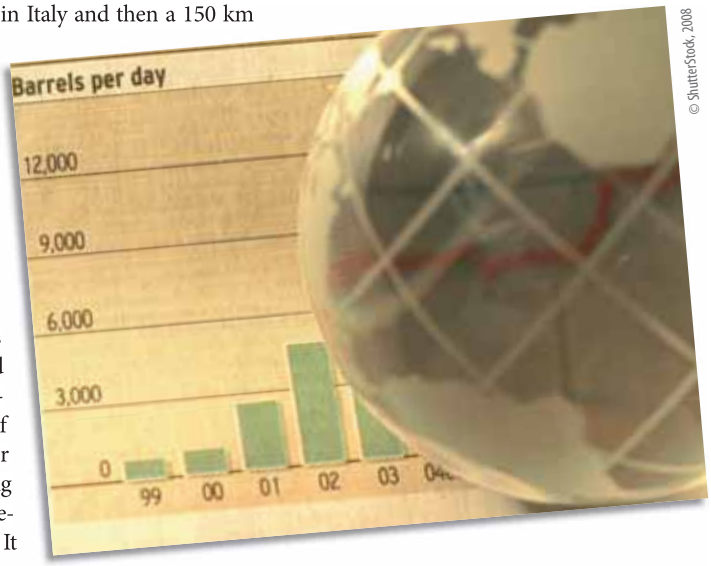

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Solutions to secure the excavation-disturbed zone

Deep inside the Jura Mountains, European scientists made a critical discovery that could help prevent radionuclides from leaking out from future geological repositories.

Nuclear power plants comprise an important component of the energy portfolio of several EU Member States. What remains undecided is where to safely store the radioactive waste produced by these plants. One idea gaining popularity is that of a geological repository built into clay deposits.

One issue that must be addressed, however, is the increased risk of contamination via the excavation used to access the repository. The Belgian organisation Euridice coordinated a Euratom project to investigate the impact of the so-called excavation-disturbed zone (EDZ) on the performance of underground repositories.

Building on previous research that identified the ideal borehole orientation, the National Cooperative for the Disposal of Radioactive Waste (NAGRA) and its Selfrac partners drilled new boreholes at the Mont Terri research facility in Switzerland. Once filled with synthetic formation water, special equipment, such as dilatometers, was employed to measure transmissivity along the borehole wall.

Nagra demonstrated that transmissivity could be significantly reduced in the EDZ by boosting the dilatometer pressure to 5 MPa. The result is that the capacity for fluid transfer along the axis of the borehole is reduced by several orders of magnitude. This substantially reduces the risk of radionuclides escaping and contaminating the surrounding environment.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4313

Making power system operation more robust

The technical consequences of distributed generation (DG) penetration in power system operations have been examined in order to analyse the different facets of system robustness.

The CRISP project has investigated, designed and tested ways in which information and communication technologies (ICT) innovation can be exploited for cost-effective and reliable monitoring, management and control of power networks. Software was designed for the development of interactive intelligent distribution networks with improved regional monitoring and control potential within a new integrated EU-distribution network. Numerous laboratory and field tests were conducted in various countries which resulted in practical advice for the use of intelligent ICT in high-DG power networks.

Following this, a detailed description of the power system was created to examine technical consequences and blackout measures mainly occurring in transmission. It defines important events and defence plans. Furthermore, a specific criterion was suggested because of its ability to indicate the real time situation regarding stability.

The real time evaluation of stability occurs cell by cell and is combined at a higher level. This enables a more intricate stability study with the use of a scalability parameter which simultaneously accounts for local and global constraints. Moreover, future demands for control and communication are specified for different types of power system applications on a local scale.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3947

Intelligent load shedding for distributed generation

Engineers with ABB Automation Technologies AB in Sweden have made recommendations regarding the optimisation of load shedding as power generation becomes increasingly distributed.

Load shedding is used in situations when the demand for electricity exceeds the supply in order to maintain the stability of the network. The emergence of information and communication technologies (ICT) has opened the door to intelligent load shedding (ILS). The European Commission has in turn allocated research funds to promote the adoption of ILS techniques.

For example, the CRISP project consortium was awarded funding to investigate the application of ILS to power networks with a high degree of penetration of distributed generation (DG). DG is expected to grow in the EU as its Member States ramp up energy production from renewable energy sources (RES).

The study, led by ABB Automation Technologies AB, began with an extensive review of load shedding techniques. Threats such as large power oscillations were described in detail. In addition, ABB analysed aspects unique to DG networks. Their findings underlined the need to develop fresh approaches to ILS.

In response, three concepts were proposed: smooth load relief (SLR), critical preventing action (CPA) and distributed load shedding (DLS). ABB and its CRISP partners believe these new ILS techniques will be able to deliver the necessary level of stability to Europe's power networks. Further information is available in a summary document.

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

Collaboration sought: information exchange/training.

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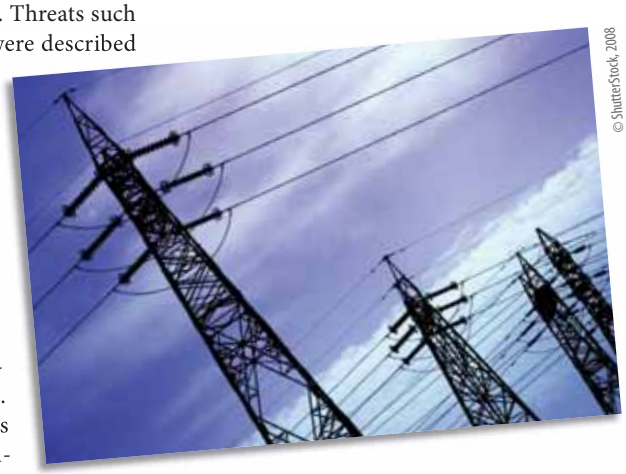

Efficient solar cell energy production

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 of 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 multi-crystalline 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 twenty to a hundred Ohms per square centimetre of the emitters' 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

Industrial solar cell using aluminium and boron

A solar cell was developed that is suitable for use in an industrial environment. The cell uses both boron and aluminium diffusion for the back-surface field (BSF).

The INDHI project took the results of laboratory research into high efficiency solar cells and placed them in a real industrial environment. This was achieved through the development of a new fabrication process for industrial, large scale multi-crystalline silicon (mc-Si) solar cells.

The BSF is part of the structure of a solar cell. At present mc-Si solar cell production technology uses an aluminium alloying process for forming the BSF, giving a back contact of low resistance. However, the next generation of high-efficiency solar cells need a BSF of much higher quality. Earlier experiments using float-zone silicon (FZ-Si) cells showed that the BSF could be improved by using aluminium and boron together, instead of only aluminium.

When this process was applied to mc-Si solar cells, the result was better BSF quality and increased cell parameters and conversion efficiency. Other improvements included an increase in long wavelength response, short-circuit current and open-circuit voltage. These results indicated that mc-Si solar cells with a BSF formed by mixing aluminium with boron performed much better than with just aluminium.

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 > 4166

Supercritical water converts biomass to biogas

A novel project focused on the cost-effective production of renewable hydrogen and methane (substitute natural gas or SNG). Supercritical water (SCW) was used to convert wet biomass into biogases.

Large amounts of biological material, referred to as biomass, are generated by waste water treatment, agriculture and the processing of agricultural products. Some of these residues can be used in the production of animal fodder, fertiliser and compost. However, the market for compost is now saturated and the health regulations surrounding fodder and fertiliser have become increasingly strict. Although the remaining residues can be placed in landfill sites or incinerated, it is an expensive option.

The Superhydrogen project used SCW technology to turn wet biomass (containing water) into hydrogen or SNG. SCW used moderate temperatures and high pressure to help water to break down large organic molecules into smaller, less toxic ones.

The Superhydrogen pilot plant used feedstocks that are relatively easy to break down including rapeseed methyl ester (RME) glycerine, and vinasse. Vinasse is the residue left behind after the production of ethanol. RME glycerine was the preferred feedstock since its correct disposal is a growing problem within the EU. A smaller bench-scale unit was used for more complicated feedstocks, which contained a high lignin and/or ash content.

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 > 4323

See also page 24 (Treatment of wastewater by titanium dioxide and photo-Fenton)

Modifying yeasts to increase ethanol production

Dutch scientists experimented with yeast in the laboratory in an effort to boost ethanol production from lignocellulosic biomass, a renewable resource.

It is anticipated that biofuels will play an important role in Europe's quest to reduce carbon emissions. Ethanol is a promising biofuel, especially when produced from the fermentation of lignocellulosic biomass, such as agricultural and wood residues. The TIME project received funding from the Fifth Framework Programme (FP5) to advance the state of the art in this field.

Scientists with the Nedalco Research Laboratory contributed by optimising the strains of yeast used in the fermentation process. Techniques were developed to enable hydrolysis even in the presence of toxic substances. The effect of pretreating the lignocellulosic material, for example with steam, was also investigated.

The capacity of more than 20 different strains of yeast to produce ethanol was assessed. In general, the industrial and genetically modified strains outperformed their laboratory counterparts, especially with respect to tolerance to toxins.

Finally, the Nedalco Research Laboratory discovered that it could significantly enhance ethanol production through yeast mutagenesis. In fact, they managed to nearly double the rate of ethanol production and boost yields by as much as 50 %. These results will be exploited to reduce the energy consumption and production costs associated with ethanol, making it an even more attractive biofuel option.

The new knowledge acquired by the Nedalco Research Laboratory and its TIME partners is being shared with the academic community through conference presentations and scientific publications.

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 > 4342

Advanced turbulent heat transfer for internal combustion engines

As a basis for precise simulation of real air and fuel flows in an internal combustion (IC) engine, it is of utmost importance to be able to model turbulence accurately. This is a major influencing factor on the evaporation of liquid fuel droplets and subsequent combustion of the air/fuel mixture.

The flow of air and fuel in IC engine cylinders is almost always turbulent. The more turbulent the air flow is, the greater the degree of mixing air and fuel that can be achieved prior to ignition. Although turbulence at the instant of ignition may lead to rapid and complete combustion, it is also related to higher rates of heat transfer to the cylinder walls that reduce the engine's thermal efficiency.

Within the Minnox project, some of the major names in the European automotive industry joined their experience and expertise with Europe's leading universities. Their ultimate aim was to develop a physical model for accurate predictions of heat transfer, velocity and temperature profile inside the cylinder of an IC engine. This model would be validated with measurements provided by an advanced experimental setup developed during the course of the project.

The numerical approach is particularly attractive for the automotive industry due to its ability to produce and analyse results within a reasonable time frame. It can introduce a significant speed-up in the engineering design and furthermore, in its optimisation process. The model proposed by project partners at the Delft University of Technology is simple so that it can be implemented into commercial computational fluid dynamics (CFD) codes. Yet, it is able to capture the most important effects occurring in the engine cylinder, including near-wall and transient effects.

The approach adopted in this work was elliptic relaxation modelling, which is one step ahead of the current two-equation models but still one step behind the full Reynolds stress model. For a turbulence model requiring sufficiently fine computational meshes, new generalised wall functions that are not constrained by the common equilibrium assumptions were added. Verification of the model in idealised configurations was shown to be in agreement with temperature and velocity calculations from experimental and large-eddy simulation (LES) data.

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 > 4327

Radioactive waste management

The 'Heater experiment' project conducted at the Mont Terri underground laboratory has provided valuable input for the long-term safety of underground repositories for radioactive wastes.

Deep underground disposal is the option favoured internationally for the long-term management of radioactive waste with significant contents of long-lived radionuclides. To enhance confidence in the protection of the environment and human health, several natural geological and engineered barriers have been used to complement each other.

A reduced-scale demonstration test sought to provide a deeper understanding of how best to assess the performance of this complex barrier system after emplacement of the waste packages. It was conducted during the course of 'Heater experiment', a project supported by the Fifth Euratom Framework Programme to evaluate the coupled thermo-hydro-mechanical (THM) phenomena that are expected to occur.

The near-field environment is impacted by radiogenic heating and infiltration of ground-

continued on page 19

Tool for aeroelastic stability in wind turbines

An increasing number of large wind turbines are being built in Europe to provide renewable energy in order to reduce carbon emissions. The Stabcon project developed tools for optimising large wind turbines with respect to aeroelastic stability.

The Stabcon project developed reliable design tools that allowed better and safer large wind turbines be built. The tools helped to identify important parameters for aeroelastic stability and to suppress instability. Turbines are not completely rigid and aeroelastic phenomena occur when changes in the structures' shape cause changes in aerodynamic forces.

The researchers developed GAST aeroelastic software to study the design of rotors and rotor-pylons in wind turbines, helicopters and propeller aircraft. The tool was used for carrying out the analysis of eigenvalues in vacuum and steady state conditions. It was also used for stability analysis and aeroelastic simulations.

The software comprised a dynamic/structural model based on a multi-body approach. Flexible bodies were treated as linear beams and a rotor aerodynamics module was based on blade element momentum theory. The dynamic equations for the beam were supported by equations from the ONERA model, which had been developed in the past by the French aerospace industry. The aeroelastic equations of the beam were solved using the finite element method (FEM). The work of Stabcon has helped strengthen the position of the European wind turbine industry and research community.

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

Collaboration sought: available for consultancy.

http://cordis.europa.eu/marketplace > search > offers > 4344

Reducing the vulnerability of offshore wind turbines

The TURBU Offshore software package enables its users to better design wind turbines to withstand the rigors of deployment at sea.

Various combinations of wind and waves can generate harmful vibrations in wind turbines located offshore. The instabilities that develop can damage components, negatively impact power production and reduce lifetime expectations. The Stabcon project investigated passive and active methods to overcome this phenomenon.

Wind energy experts with the Energy research Centre of the Netherlands (ECN) contributed to Stabcon by developing computer software for offshore wind turbines. The program, entitled TURBU Offshore, employs a frequency domain analysis approach.

Wind turbine components such as the rotor shaft and blades are approximated by a system of masses, springs and damper elements. Analysis of up to six degrees of freedom of movement (e.g. yaw, roll, bending, etc.) at a time is possible. The equations of motion are addressed using a linear time-invariant approach with a fixed coordinate system. A number of component ECN models covering aspects such as dynamic stall and cylindrical wake motion have also been integrated.

Wind turbine manufacturers can use TURBU Offshore to design prototypes incorporating passive and active control measures. A stripped down version of the software is to be made available to the public, though ECN advises that TURBU Offshore be used only by individuals with suitable qualifications and experience.

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 > 4361

continued from page 18 **'Radioactive waste management'**

water from the surrounding rock into the engineered barriers, resulting in swelling pressure of bentonite buffers. Scientists with the National Cooperative for the Disposal of Radioactive Waste (NAGRA) focused on the mechanical behaviour of Opalinus clay, the host rock in which bentonite buffers are embedded.

To simulate the soil as a three-phase (air, water, solid) porous medium, the hydro-mechanically coupled code Mherlin was used. Moreover, the predictive capabilities of rock characterisation tools and techniques incorporated in this three-dimensional finite-element code were extended. The code required continued development and validation. This was undertaken with respect to available data from laboratory and reduced-scale field tests.

Improved understanding of Opalinus clay, which is a reference formation for geological disposal of radioactive waste studied across the European continent, can provide a solid basis for safety case development.

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 > 4349

Stonewalling degradation of Europe's heritage

The University of Portsmouth and its Biobrush partners have discovered an environmentally-friendly, low-risk method for preserving Europe's vast stone heritage.

Several major European cities are home to ageing stone structures that comprise an integral part of the continent's cultural heritage. Unfortunately, these treasures are increasingly threatened by urban air pollution. Oxides of nitrogen and sulphur emitted into the atmosphere are transformed into acidic compounds that weaken and degrade the stone.

Looking to move beyond traditional mechanical and chemical methods used to reverse the damage, the EESD programme funded research into bioremediation techniques. The project, entitled Biobrush, investigated the application of biocalcifying bacteria.

Microbiologists from the University of Portsmouth, the Biobrush coordinator, examined the possible risks associated with this approach. With regard to changing the composition of the stone itself, no problems were identified apart from a small sensitivity of highly aged marble. In addition, no significant colour variations were observed. However, excessive application of the bacteria can lead to cracks in the surface layer.

The University of Portsmouth also evaluated the influence of the carrier material used to deliver the bacteria to the stone. Definite conclusions could not be drawn for carbogel, but sepiolite was found to increase water uptake and porosity in most cases. In general, the technique is well suited to some types of stone, such as sandstone, but less so to others, for instance limestone.

Finally, the application of the bacteria did not appear to have any lasting effects with respect to microbe populations on the stone surface. Taken as a whole, the results of the risk assessment indicate significant potential for the use of biocalcifying bacteria throughout 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 > 4165

Clustered support for urban drainage

CityNet, a group of urban development projects has participated in a cluster conference presentation which has resulted in a branch of publicly accessible outcomes for the improvement of urban storm water management.

Pollutants in storm water have had a significantly negative impact on water quality in urban areas. In light of this, the Daywater project has developed an adaptive decision support system (ADSS) which can be used by decision-makers dealing with urban storm water management. The ADSS combines simulation models, assessment tools, databases, guidelines, documents, road maps, etc. Models which simulate pollution fluxes were developed in order to assess discharge of significant storm water pollutants to surface waters, urban soils and ground waters.

The research, consisting of a multi-disciplinary research team as well as end-users and case studies from four European cities was presented at the '10th international conference on urban drainage'. Daywater was part of the CityNet cluster conference which took part in platform sessions as well as workshops. Additionally, a CityNet book was published consisting of an introduction to the cluster and cluster activities, sections based on papers from the conference and an overview and conclusions.

CityNet's budget was reserved to sponsor five key players from eastern Europe and developing countries, guaranteeing that they receive exposure to the results and technology. The selection criteria for candidates were based on their capacity to contribute to promoting CityNet globally. Also taken into consideration was their representation of a significant international organisation and the desire to keep a geographical balance across CityNet's sponsors.

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 > 4334

Early warning system for beach damage

Scientists working on the EU-funded Medcore project have been monitoring environmental changes occurring on Mediterranean beaches. Using bioassays as a measuring technique, researchers tested the behavioural variation of the common sand hopper and found that the results tell coastal managers where and when beaches start degrading.

Beach profiling is the common way of monitoring beach erosion, but the problem with this is that it can only provide a snapshot as it strongly depends on seasonal, climatic and tidal changes. Organisms are extremely sensitive to environmental changes and so modifications in behaviour may sound an alarm. Deviations in an established pattern may be telling us that we need to protect our vulnerable coastlines.

This research began with the hypothesis that 'animals living on the beach know its trend of change and will orient accordingly'. Researchers carried out the experiments on various beaches in the Mediterranean, including southern Tuscany and the Mediterranean coast of Morocco. On the Italian beach, the researchers examined the orientation of sand hoppers. Four points one kilometre apart were studied, compared concurrently, and the distribution of sand hoppers recorded. The teams found that at the eroded point of the coastline there was a more disperse scattering of sand hoppers. On the Moroccan beach, the teams conducted the same test. This time, the researchers found that the differences in orientation corresponded to the different uses of the beach.

The scientists have designed the study so that coastal managers can implement it at a low cost, and obtain results easily and rapidly. This means that the authority can intervene before the damage done to beaches becomes irreversible. By applying restrictions and measures to respect the natural equilibrium on the beach, this study helps contribute to sustainable tourism.

The research team is furthering its testing to assess the environmental impacts on different coasts of the Atlantic, Pacific and Baltic, where it will be collaborating with local teams of ecologists.

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 > 4169

International conference celebrates Medcore project's achievements

A conference organised by the University of Florence has taken place, bringing together participants of the Medcore project and interested parties. It was an opportunity to exhibit and discuss the results of new research on supporting the Mediterranean coastal environment.

The Medcore project took shape with the support and funding of an EU programme. Set up as part of the Incomed framework, its overriding goal was to study the ecology of Mediterranean coastal zones to promote sustainable management. Thirteen separate research institutions were involved in the project. Over the three-year duration of the project, it shaped the creation of a childrens' book on sea grass meadows or developed early warning indicators for beach degradation.

The University of Florence hosted the conference entitled 'The Mediterranean coastal areas from watershed to sea: interactions and changes'. About 300 participants attended the conference. During these four days, researchers presented their results, all with the shared aim of preserving the natural heritage of these coastal zones for future generations. Attending the conference were members of the research network but also environmental managers, with the aim of keeping informed on this research. The general framework of the conference focused on the general themes of socio-economic aspects, changes in landscapes and inhabitants, marine ecology, diversity in the catchment areas and sandy beach environments.

Accompanying the conference was a brochure printed by Firenze University Press. The document includes 55 abstracts of spoken and paper presentations of the Medcore project. The abstracts are in both English and French and are about one or two pages each. 120 authors from 16 countries contributed to the volume, which totalled 109 pages. A picture logo designed by artist Luigi Scarpini illustrates the cover, whilst the first pages display the names, e-mails and addresses of the authors. There is also a list of the sponsors, institutions and committees involved in the project. This is available to download for free in PDF format at http://eprints.unifi.it/information.html

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 > 4209

In search of more accurate climate forecasts

The level of accuracy associated with the radiative properties of fluorocarbons has been significantly improved through work performed at the University of Reading in the United Kingdom.

European climate scientists have made significant contributions to support bodies such as the Intergovernmental Panel for Climate Change and instruments like the Kyoto Protocol.

The Cryostat project, involving 11 partners from across Europe as well as Australia and the United States, is a prime example. The focus was on the cryosphere and determining past atmospheric concentrations of trace gases relevant to climate change and the stratospheric ozone layer.

The University of Reading, a Cryostat partner, collaborated closely with other organisations to address inconsistencies in estimates of the global warming potential of fluorocarbon compounds. Specifically, the attempt was to quantify radiative efficiencies expressed in units of Watts per meter squared per part per billion by volume (ppbv).

The spotlight was on species emitted from anthropogenic sources, including refrigerants like HFC-134a, HFC-23 and others. Both laboratory measurements and models were used to reach consensus on the radiative efficiency and associated error bars for a number of fluorocarbon compounds. Noteworthy departures from previous estimates were identified and rectified during the project.

The results of Cryostat, which have been published in scientific journals, could help instil greater confidence in predictions of the future state of the climate.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4359

Better accounting for climate policies

Research undertaken at the International Centre for Research of Environment and Development looked into the way climate policies are measured. The study examined the way in which climate policies are conceptualised and how this impacts the results.

Almost everything has an economic cost attached to it including the environment around us. By attaching a cost to the environment and ecosystem, policy-makers are better able to determine the impact that certain policies have on the environment. In this manner society can come to a better decision on how sustainable development can be achieved.

The EESD project Transust aimed to contribute to sustainable development by focusing on key activities crucial for social well-being and economic competitiveness in Europe. To achieve this aim one team of project partners looked into how economic costs are determined, used and interpreted in various economic models.

Until this study, there existed a discrepancy in how the environmental costs were measured between the pessimists who overestimate and optimists who underestimate the costs. As a result, negotiations and discussions that were held were usually conducted with diplomatic rhetoric which was not linked to grounded scholarly economic analysis of either side.

The way in which the costs of carbon policies are reported can be skewed as a result of two common biases. The first bias stems from the model from which the cost estimate is initially made. The three common modeling paradigms offer three different costs. The models are the disaggregated technology-rich bottom-up model, the multi-sector top-down model (be it based on micro-economics or econometrics) and the single-agent optimal control model. The differences exist as a result of the way in which production and end-use technologies are accounted.

Another bias occurs in the choice of the manner in which modelling results are eventually presented. The results can be open to 'massaging', to present a message which the researcher wishes to present, be it pessimistic or optimistic.

As a result, the method of communicating the true costs of climate policies is fraught with difficulties. This project aimed to bring these difficulties into the light in a manner that encourages more debate and with the minimum of confusion.

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 > 4086

Gauging the impact of CO_2 taxes on GDP

Scientists from a Dutch university have authored a paper that examines the use of computer models to assess the effects of carbon dioxide (CO_2) taxes.

CO_2 taxes are an economic instrument designed to help reduce CO_2 emissions. Several countries are considering implementing such taxes as part of their strategy to meet their Kyoto targets.

Computer models can provide useful insight into the economic and environmental impacts of such pollution taxes, yet all models are not the same. In the context of the Transust project, the response of a number of different models to CO_2 taxes was evaluated. Specifically, the environmental studies arm of Vrije Universiteit Amsterdam (VUA.IVM) performed a model intercomparison regarding the effect of CO_2 taxes on gross domestic product (GDP) and energy production.

While the results were generally inconclusive with respect to GDP, the Dutch researchers did learn that the only route to a positive GDP effect was to intelligently recycle the CO_2 tax revenue. Some variation between models was identified, for example the inelasticity of the econometric models led to limited CO_2 reductions.

An investigation of the way in which CO_2 reductions were achieved revealed that energy savings were of primary importance. The degree to which low carbon and renewable energy sources (e.g. wind) were substituted for carbon-intensive fuels like coal depended on how well these aspects were treated by the model.

The VUA.IVM scientists have collected the Transust findings in a summary paper to facilitate dissemination of the new knowledge.

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 > 4111

Tall trees can increase carbon sequestration

The relationship between carbon levels and biomass has long been known albeit not fully understood. In an effort to gain more knowledge and understanding of this relationship an EU-funded project grew and analysed several hectares of poplar trees.

To fully understand the effect of global changeon biospheres, the experimental forests had to be specifically designed at an ecosystem level. Lab tests or small-scale experiments can provide information, but conditions are not as closely matched to real-life situations as desired.


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The Euroface project therefore set out to grow a series of forests over a nine hectare area to be compared with six experimental plots. Each hectare of forest with one type of poplar would support 5 000 trees and these would then be used to assess elevated atmospheric CO_2 concentrations over a long-term period. This ecosystem-scaled project has had a spin off benefit, found primarily in the fact that it supports enough biomass to encourage investigations by numerous other research scientists. Armed with this amount of data, they can conduct investigations into a variety of different aspects of an ecosystem's response to CO_2 enrichment.

The experimental plot was divided into six fields, with three different poplar genotypes planted at a density of 10 000 trees per hectare. Each tree was spaced one square metre apart and after the three-year long growth cycle, the trees reached a height of almost ten metres. A second rotation cycle later produced trees of 12 m high, and in both cases, the total biomass of the trees were given to an electrical power plant to help produce C-neutral electrical power.

While the supply of timber for the production of energy proved to be an added bonus to the project research, its initial cause was to establish an infrastructure the larger scientific community could benefit from. Furthermore, the uptake and storage of carbon under conditions of global change can be quantified.

Net primary production of the experimental plots showed an increase of up to 36 % on the control. This being the case, rising atmospheric CO_2 could increase the potential for carbon sequestration. Further research and developmental support is sought, with current results available for demonstration.

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 > 4369

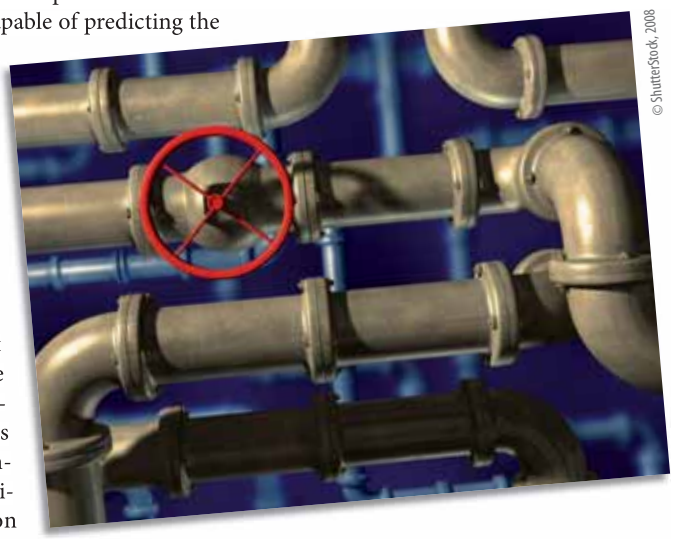
Water management in cities

As cities evolve the need for more sustainable systems of water resources and infrastructure becomes more apparent. This project sets out to investigate how existing systems can be improved with the help of computer tools.

The infrastructure of modern cities lags behind the rate of development that is needed for cities to sustain their populations in the future. There is an evident need to address the issue of sustainable management of urban water systems. This study addresses this by attempting to identify the principle problems urban water management is facing today and assessing the impact of pollution on groundwater resources.

The cities of Doncaster (United Kingdom), Ljubljana (Slovenia), Mt Gambier (Australia) and Rastatt (Germany) provided case studies for the project. They were selected due to their different approaches to the management of the existing urban water systems. A detailed description of the economic and demographic profile of four case study cities was provided. Data regarding the different hydrogeological and hydrological settings provides a backdrop for comparisons to be made. This is particularly due to the fact that they display significantly different approaches to the management of their respective existing urban water systems. The studies provide an overview of each city's water infrastructure and data about the groundwater quality.

These studies make up the AISUWRS project which has developed a number of models which are capable of predicting the effects of urban infrastructure on ground water contamination. Currently there are six models in total, including a pipeline leakage model and an unsaturated flow model, which predicts water transport to the aquifer. The unsaturated transport model predicts the transport of contaminants to the aquifer and the decision support system (DSS) model compares the costs of infrastructure rehabilitation with the costs of aquifer contamination.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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 > 4101

See also page 26 (Learning good practices for river basin management)

Ozone and biotreatment technology for wastewater

Hybrid technology used ozone and bioprocesses to treat wastewaters containing priority hazardous substances (PHS). The system significantly reduced the cost of treating wastewater, which could then be reused in agriculture, industry or for recharging the water table.

The CADOX project focused on treating water contaminated with chlorinated solvents and pesticides, which have been identified as being potentially harmful to human health. Ozone and biotreatment were employed together to decontaminate water containing a range of pesticides. Tests were initially carried out on synthetic effluent in order to optimise the conditions used for ozone. The results were then expanded to a full-scale industrial pilot plant. The plant allowed researchers to treat different effluent flows and to test different concentrations of ozone.

Researchers produced ozone from dry oxygen, providing a low gas flow in high concentrations. The gas was injected into two contact columns in series, with each column using a different mode of ozone transfer. In the first contact column a small quantity of ozone was introduced via a hydroinjector. In order to facilitate contact between the effluent and ozone gas, a recirculation pump drew off gas from the second contact column via a second hydroinjector.

The second contact column used conventional ozone transfer by employing stainless steel porous diffusers. High ozone levels and the use of dry oxygen meant that conventional PVC porous diffusers were unsuitable. Any ozone contained in the vent gas leaving the first column was eliminated by a thermocatalytic ozone destroyer.

Ozone, coupled with biological treatment, is one of the cleanest technologies for treating contaminated water as it produces no sludge, nor harmful products. The use of this emerging technology will help the European water industry to become more sustainable and competitive. This in turn will enable European industry to achieve a greater share of the global market for cost-effective industrial water technology.

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 > 4378

Treatment of wastewater by titanium dioxide and photo-Fenton

EU legislation in the form of the IPPC Directive (96/61/EC) precipitated the development of technologies for water recycling and pollution control for specific industrial sectors. The photo-Fenton and titanium dioxide wastewater treatment systems were assessed for their suitability in treating water containing chlorinated solvents.

Many industrial activities had failed to carry out adequate treatment of wastewater due to a shortage of available on-site systems. As a result of the IPPC Directive, suitable cost-efficient technologies became highly sought after.

The CADOX project investigated both the photo-Fenton and titanium dioxide (TiO_2) photocatalytic treatments for wastewater heavily contaminated with non-biodegradable chlorinated solvents (NBCS). Both systems aroused interest because they used sunlight to generate hydroxyl radicals with a semiconductor which absorbs UV radiation when immersed in water.

It was shown that both systems were feasible for treating water contaminated with NBCS. However, if the process was to be carried out on a large scale it would not be possible to make the photoreactor airtight. Therefore, anaerobic conditions were strictly applied during TiO_2 treatment to prevent NBCS being released to the atmosphere.

The photo-Fenton method was considered more appropriate for large-scale operations. Photo-Fenton uses Fenton's reagent which comprises hydrogen peroxide and an iron catalyst. Great care was taken to ensure that the reactor operated at the correct temperature, as this affected the production of NBCS and reaction rate. The initial concentration of hydrogen peroxide was also a key factor in controlling NBCS photocatalytic treatment.

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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 > 4357

See also page 17 (Supercritical water converts biomass to biogas)

New initiatives improve accessibility in Winchester

Trials involving recycling, environmentally friendly transport and the availability of better maps have been conducted as part of the Miracles project in the city of Winchester. These trials have been successful in improving the environmental impact caused by urban distribution.

The city of Winchester located in southern England, relies on a historic road system. It is the problem of freight delivery along these historic roads, which has exacerbated traffic flow and has been the focus of the Miracles project. This was aptly named, as it used to be near impossible to imagine Winchester city centre without the traffic caused by delivery services and the knock-on effects such as noise and poor air quality.

The project set out to achieve two main aims: firstly, to increase the efficiency of freight delivery in Winchester and secondly, to develop a clean urban delivery system that would become self-sufficient at the end of the project.

The researchers began by conducting detailed surveys of over 450 shops and

continued on page 25

Changing transport modes, improving sustainability

In the Netherlands, Tellus, an EU-funded project, has provided the citizens of Rotterdam with an alternative, carbon-free transport mode, the Automated People Mover (APM).

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The shuttles, working on a fixed infrastructure, i.e., having a set route, provided alternatives for travelers in an effort to encourage greater use of public transport. The original project, begun in 1997 had some serious drawbacks which were amended. For example, originally, there were only three 12-seat shuttles. These have been replaced by six 20-seat shuttles.

The shuttle programme constitutes only one aspect of a wider project. With multiple approaches to improving transport, there were consequently multiple goals to achieve. The goals spanned from the reduction of city congestion to generating commercial value from the research and implementation.

Several other noteworthy improvements were made. Three additional stops were created, bringing the total number to five. Better integration of commercial and residential zones with the public transport station is another improvement. Finally linking the line to the University of Hoboken and converting it to a two-lane track throughout its course is another upgrade from the original project.

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

Collaboration sought: joint venture agreement.

http://cordis.europa.eu/marketplace > search > offers > 4365

Innovative aircraft arrival and departure procedures

Innovative aircraft arrival and departure procedures were developed and validated. The intention was to reduce environmental impacts, cut costs and maintain safety.

Aircraft can have a considerable impact on the environment and those people living and working close to flight paths and airports. The 'Sourdine II' project addressed these problems through the development and validation of new, innovative procedures for the approach and departure of aircraft. The aim of the new procedures was to reduce noise and emissions and to improve safety, capacity and financial performance. An overview of current practices and future technology was also undertaken.

The information provided from an international panel of experts was used to develop the first draft of a set of potential procedures. An assessment was carried out using single event simulations (SES) with Airbus aircraft performance and noise calculation tools. The aircraft used in the study included the short/medium-range twinjet A320-200 and the long-range four-engine A340-300.

Researchers carried out performance studies to calculate operational trajectories by using procedure descriptions. This enabled the first selection of initial procedures to be drawn up, which indicated the performance characteristics and limitations of the aircraft. The trajectory data was included in single event noise prediction, which was undertaken using the Airbus 'Noise level calculation program' (NCLP). Finally, five approach and three departure procedures were chosen to be further assessed in greater detail during the lifetime of the project.


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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4332

continued from page 24 **'New initiatives improve accessibility in Winchester'**

businesses in the area. Three main initiatives came out of this. One concerned the company Collectpoint plc, which was capable of providing an alternative to home delivery. The company offered collection points conveniently located in general stores and so provided an alternative address for delivery of goods that were ordered primarily online. With the support of the project the company was able to expand their service.

Another initiative backed by the project concerned Dove Recycling, a company which collects recycled waste from local businesses. Dove Recycling replaced diesel vans with electric vans for their collection service.

The final initiative pursued by the project was the production of a Winchester freight map which showed the appropriate routes, main delivery destinations and vehicle restrictions in the city. Thousands of these maps were distributed to local service areas, filling stations and Winchester businesses and were found to be a very useful tool.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4336

Modelling the changing face of snow

Simulations performed by the Norwegian Water Resources and Energy Directorate (NVE) have provided insight into the spatial and temporal variation of snow parameters across Europe.

Many mountainous regions depend heavily upon the contribution of snowmelt to local drinking water supplies. Unfortunately, climate change is increasing the risk associated with this water resource by changing the location, frequency and intensity of snowfall events.

The Envisnow project was funded by FP5 to improve our knowledge of and ability to predict snow parameters. During Envisnow, the NVE attempted to model the seasonal evolution of 'snow covered area' (SCA) and 'snow water equivalent' (SWE).

They employed a rainfall-runoff model which they fed with precipitation and temperature data from the 'High resolution limited area model' (Hirlam). The model was run at high resolution (1 x 1 km) for three large catchment areas in Norway.

The hydrologists at NVE subsequently carried out a statistical analysis of the model output. They found high levels of skewness in the modelled SWE at the beginning of the snow season when accumulation dominates. The same was true at the end of the season when ablation eclipses accumulation, while in between skewness declined.

NVE also learned that spatial variation in precipitation caused by changes in land coverage could strongly influence SCA. Specifically, alpine and forested areas adjacent to one another often presented dissimilar patterns of SCA.

Finally, it should be noted that NVE's findings support the recent trend in snow modelling of treating SWE as a gamma-distributed variable.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3848

Developing an analytical framework for water supply

A clean water supply is vital for maintaining a decent quality of life. Therefore, an analytical framework and best quality guidelines have been developed to ensure high quality public water supplies.

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The Watertime project helped policy-makers working in the public sector to choose the right course of action regarding water systems in 29 European cities. The work helped improve the decision-making process and took into account economic, social and environmental factors. A formal framework was developed for studying data resulting from the implementation of public services for water. The analytical framework was based on a comprehensive literature search of relevant case studies.

The data was collected through a series of spreadsheets and databases and the resulting information collated in a common, coherent format. The case studies reflected how decisions were arrived at and identified local, national and global actors. The results were used to draw up a series of best practice guidelines. These recommendations and the decision making framework help to improve the health of European citizens through improved monitoring and regulation of the public water supply.

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 > 4204

Learning good practices for river basin management

Participatory river basin management and its function within the EU Water Framework Directive have been examined, focusing specifically on social learning across 11 European case studies.

The Harmonicop project has heightened the understanding of participatory river basin management in Europe and supported the implementation of the Water Framework Directive on this matter. The involved research concentrated on crucial and scientifically challenging aspects such as scale issues, the role of information and ICT tools and the cultural, political and geographical influences.

Following this was the design of work package five which focused on obtaining first-hand experience with public participation (PP) in river basin management. In this way, the application of social processes and ICT tools and models utilised at the river basin level could be examined. Furthermore, issues identified in previous work packages of the project were tested and the ideas of effective PP were developed. As a result, it was then possible to pinpoint the approaches that work, in order to implement them as good European practices.

The methodology consisted of a selection of case studies with a broad scope of historical, geographical and institutional backgrounds offering an analysis appropriate for a broad array of conditions. Additionally, an analytical approach based on questions gathered from earlier work packages and a cross-case study analytical template were also used. The template fused the findings regarding obstacles to social learning and the processes which underpinned social learning from the case studies in order to bring out similarities and differences.

The conclusions of the research were vast. Some of these include the importance of context and team building to create resilience with the aid of facilitators and leaders and the creation of a good attitude from positive interaction.

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 > 3864

See also page 23 (Water management in cities)

Climate change data emerges from the mire

Policy-makers in Europe require climate models for effective future economic strategies. The bogs of Europe are providing unexpected evidence of abrupt climate change on which valid predictions can be based.

The appropriately named project 'Abrupt climate changes over the European land mass' (Accrotelm) has collected valuable proxy-climate data. This is whereby one physical measurement can be used as an indicator of another. The project has extracted biomarker information from present bog-forming vegetation and compared it with data going back as far as 3 000 years.

Deriving this information is possible due to the unique structure of the peat bog. The upper layer is peat-forming and relates to recent changes. The layer below the water table, however, contains clues to long proxy-climate records. The period under study by project partners based at the University of Bristol included the climate change witnessed from the Medieval Warm Period to the Little Ice Age. This brief cold spell of about two centuries froze whole rivers across northern Europe and is thought to have ended in the early 19th century.

Peat bogs from Germany, Ireland, Finland and the United Kingdom were studied. About 400 peat samples were taken and analysed by gas chromatography and or mass spectroscopy (GC/MS). Residues extracted with lipids were characterised by pyrolysis-GC/MS which generates smaller, more volatile compounds that can be analysed easily using GC/MS.

Identification of new and established biomarkers using these methods of analysis enabled the determination of changes in the macrofossil proxy. Even with anaerobic conditions prevalent in such a hostile environment to most microbes, decay occurs. Therefore, the presence of certain macrofossils could be determined by proxy where they were scarce or decayed.

Another line of research involved hopanes. These are carbon-based molecules associated with making prokaryotic plasma membranes more fluid and are reliable bio-indicators of the presence of certain bacteria. Using compound specific stable isotope investigations, parts per thousand of the 13C isotope were measured (d13C) and hopanoid biomarkers were identified. Furthermore, the differences (dD values) in 13C isotope between samples in other bogs could then be obtained.

The Bristol Biogeochemistry Research Centre at the university is continuing this line of research. They have published the accrued geochemical data as temperature signals from bogs, a reflection of changing climate. The biomarkers are also an indication of change in vegetation and chemical environment of the mires. For further information about the project, please visit: http://www2.glos.ac.uk/accrotelm

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 > 4315

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Lake level study into past climatic variations

Climate change is a major issue and policy-makers need reliable information to produce effective strategies for combating this challenge. However, computer models must first be validated against past climatic events to ensure their accuracy.

Research from European lakes and peat bogs has provided first-rate information on sudden changes in the climate over the last 6 000 years. The new data was used to develop better climate models and inform EU policy.

The Accrotelm project collected results from radiocarbon dating, tree-ring analysis and sediment samples from lakes in the Jura Mountains, the French Prealps and the Swiss Plateau. The information was used to create a historical record for water levels in European lakes. The results indicated an unstable climate interspersed with periods of higher lake levels.

The data also showed that solar activity played an important role in changes in climate in the area of the North Atlantic. Studies into glacier records in the Swiss Alps demonstrated corresponding fluctuations with variations in lake levels.

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A detailed analysis of Lake Joux in the Jura Mountains was undertaken. The result was a comprehensive account of environmental changes with regard to lake level and vegetation cover, over the last one thousand years. Sediment samples from Lake Joux were also studied. These provided a detailed record of the transition from the late Medieval Warm Period (MWP), a time of unusually warm climate in the North Atlantic region. The MWP was followed by the period of cooling known as the Little Ice Age (LIA). Results for the late MWP show low lake levels compared to those for the LIA which indicated higher lake levels. The results were compared with radiocarbon data which provided an insight into variations in solar activity in the past. They showed that minimum levels of solar activity corresponded with higher lake levels.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4193

Measuring the heat flux in the Barents Sea

New research carried out in the region of the Barents Sea will be useful not only to climate scientists and oceanographers, but also to members of the commercial shipping and fishing industries.

The Barents Sea, which sits off the northern coast of Europe, is an important link between the Atlantic and Arctic Oceans. Inflow of warm Atlantic water (AW) ensures that ports in Norway, Russia and other countries bordering the sea remain ice-free during the winter. This flow was the target of a focused research effort led by the Institute of Marine Research (IMR) in Bergen, Norway.

Moored instrumentation was used during the project, entitled ASOF-N, to measure temperature and velocity in the vicinity of the Western Barents Slope (WBS). This data was combined with hydrographical information to provide the most accurate estimates of heat flux to date.

IMR calculated an average net heat flux of approximately 40 TW toward the Barents Sea, though its magnitude was found to vary significantly from year to year. The flux does not always take the form of a single, large flow; it frequently separates into several smaller branches that can be offset by return flows.

The most important discovery made by IMR and its ASOF-N partners is that water temperature on the WBS is not at all correlated with the flux of AW. In fact, the flux is driven primarily by local wind conditions. Thus, it is critical to measure both temperature and velocity in order to properly assess both short-term and long-term variability.

A final component of the research project entailed a modelling exercise to fill in gaps in the observation network. IMR coupled a sea ice model, which is essential for modelling a region like the Barents Sea, with a general ocean circulation model (the 'Regional ocean model' system). This system was used in hindcasting mode to reproduce the heat flux from 1990 and thereafter throughout the duration of the project.

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 > 4362

Impact of climate change on carbon partitioning

Research was undertaken into the effect of climate change on agro-forest plantations. This included the impact of elevated carbon dioxide (CO_2) levels on wood quality and carbon allocation to long- and short-term carbon pools in trees.

Levels of CO_2 in the atmosphere are expected to increase in the future. State-of-the-art equipment used by the Euroface project allowed experiments to be carried out into the effects of increased CO_2 on agro-forest plantations. Results from black poplar *(P. nigra)* trees enabled researchers to predict the negative effects on wood due to raised levels of CO_2. This question needs to be answered because wood is a material of considerable economic importance.

The main effect of elevated CO_2 was an increase in biomass. However, the level of carbon partitioning between mobile and immobile C-pools was not affected significantly. This demonstrated the ability of *P. nigra* to maintain constant carbon levels under changing environmental conditions. Carbon-based secondary compounds, concentrations of total nitrogen (N) and lignin-bound N were also measured in *P. nigra*. The intention was to identify how secondary metabolites and internal N-pools responded to raised CO_2 and N-fertilisation.

The results indicated that neither elevated CO_2 nor an increased supply of N changed N-partitioning between lignin bound N and other N- containing compounds. A positive correlation was shown between the biosynthesis of proteins and secondary compounds. This indicated a link between growth and biochemical defence mechanisms of *P. nigra* in the plantation.

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 > 4301

Analyses of ballast water for alien seaweeds

Ballast water from ships was studied for alien species of seaweed and a screening protocol developed to protect European coastal waters.

Activities such as aquaculture, shipping and recreational boating have resulted in marine alien species being transported around the globe. The accidental introduction of alien species to European ecosystems can have a serious impact. This includes detrimental effect on the natural flora and fauna of a region, as well as on economic activity. The situation is expected to get worse over the next decade. The EU has recognised the problem and has taken measures to deal with the ensuing threat to biodiversity and natural resources.

The Aliens project took a multidisciplinary approach to combating invasive species of seaweeds to European coasts and provided information to policy-makers and environmental managers. The results were used to create a screening protocol for determining whether a species was non-harmful, potentially dangerous or fully invasive. The protocol was used when implementing policies concerning imports of aquaculture products and drawing up shipping regulations.

Results showed that seaweeds can be transported inside the ballast tanks of ships. Because no fronds were found in tanks, the colonisation of European coasts by alien species of seaweed was believed to be due to microscopic forms. From the 90 litres of ballast water analysed, 15 taxa of seaweeds were identified. This is a large number when one considers that a ship may be carrying thousands of tonnes of water as ballast. Nearly all the species identified were from the genus Ulva, which is found all around the world in marine and estuarine environments. Alien species were found in ballast water samples from Port Said at the entrance to the Suez Canal. This particular area is noted as a hotspot for the introduction of non-indigenous 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 > 4185

Easy access to information on seaweed in Africa

The results from the research project focusing on a sustainable seaweed industry in Africa have now been collated and put on a fully searchable database. The design of this new database will make it easier for interested parties to find the results they are looking for and to network.


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The Seaweedafrica project was set up to examine and record the incredible biodiversity of the seaweed that exists in the region. Until now this has remained relatively unexplored. The properties of the thousands of species that may constitute an untapped resource can now be logged and accessed. Future possibilities, such as extending their cultivation to other tropical and subtropical climates, have not been exploited. The creation of a comprehensive database, one which includes the commercial and technological properties of the seaweeds, is the main objective of this pioneering research. Moreover, it will also incorporate validated information on the ecology of the species.

The creation of the Microsoft SQL database for the project means that this aim has been accomplished. The technology used for the database ensures that fields can be searched with ease and clarity. It runs on two servers which means it can be accessed via the web and be relied upon to record the 216 categories of seaweed, the 1 114 different seaweed uses and the 230 compound species identified. Furthermore, this database includes information on legislation and regulations.

Having a comprehensive and reliable database will particularly benefit policy-makers who need to have easy access to the information stored in it. Other parties set to benefit are universities, industry and research institutions.

The site can be navigated comprehensively. It can be browsed or alternatively, in-depth searches can be carried out. There is also a picture index, providing high-quality images of species accompanied by information regarding their habitat, taxonomic source and key references. The database can be accessed at: http://www.seaweedafrica.org

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

Collaboration sought: financial support.

http://cordis.europa.eu/marketplace > search > offers > 4130

Escape performance of the grey mullet

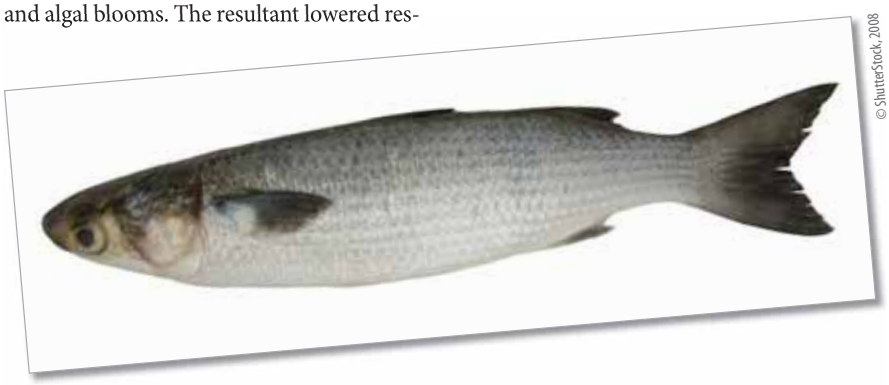
The golden grey mullet, **Liza aurata***, lives in the coastal areas of European oceans and the Mediterranean. Scientists have undertaken a study of how reduction of oxygen can affect its survival rate.*

The grey mullet is widespread and important in the fishing industry, being a common feature on restaurant menus worldwide. Fried, baked, smoked or canned, and with the leftovers making excellent soup stock, it is a versatile subject for chefs. The conservation of fishing stocks is therefore vitally important. Consequently, the European project Ethofish aimed to study the effects of two environmental variables that affect the habitat, namely oxygen levels and turbidity.

Oxygen levels in coastal zones are increasingly under threat from the imposition of an oxygen demand by organic waste input and algal blooms. The resultant lowered respiration rate of the fish in reduced oxygen conditions can have a range of effects. One of these is response to predator attack. The nature of the reactions can be categorised into behavioural and locomotory changes.

Project partners based at the International Marine Centre in Torregrande, Italy, subjected fish to predator stimulus and measured responses including maximum swimming speed, acceleration, responsiveness, response latency and choice of escape path.

The scientists took into account natural behavioural responses to lack of oxygen.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When the grey mullet is exposed to oxygen levels of 10–15 %, it indulges in aquatic surface respiration where it rests at the air-water interface. Here, diffusion produces a very thin layer of well oxygenated water. The team therefore included a trial where the fish did not have access to the surface.

Response measurements were taken at a range between 10 % (hypoxic) and more than 85 %, or normoxic, conditions. Results showed a variety of change of response. A hypoxic environment induced a slowing down of responsiveness whether the surface was accessible or not. Lower oxygen levels are therefore very likely to affect the grey mullet's chance of survival. Not only does it migrate to the surface where it is intrinsically more vulnerable, but speed and directionality were found to be adversely affected.

The significance of these trials is self-evident. The degradation of our water resources has potentially far-reaching effects on fish stocks, and therefore the viability of the fishing industry and the integrity of our marine ecosystems.

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 > 4134

Experimenting out of the classroom

Taking advantage of the pedagogical potential of emerging technologies, an innovative framework for teaching science aims to enhance a constructivist approach to everyday learning.

The 'Lab of tomorrow' project aimed to provide science teaching with as many links as possible with everyday life. Students often lose interest in science because they cannot relate what they are being taught to their daily life experiences. To overcome the barriers imposed by the traditional classroom setting, a new approach to science teaching was proposed which is based on emerging technologies.

A series of technologically advanced tools was developed to allow students to use their everyday environment as the field where they can conduct sophisticated experiments. Tiny programmable devices that can be embedded in clothing and footballs, monitor the wearer's running pace or the acceleration of the ball. This practical information can then be translated by means of graphing and analysis software components into examples of theoretical background given at school.

All wearable computers and intelligent sensors communicate through an advanced real-time communication system with a PC-based workstation on which students can investigate trends and patterns. Besides deepening their understanding of the science concepts involved in their activities, students will be challenged to learn from their own activities and more importantly, from collaborative activities.

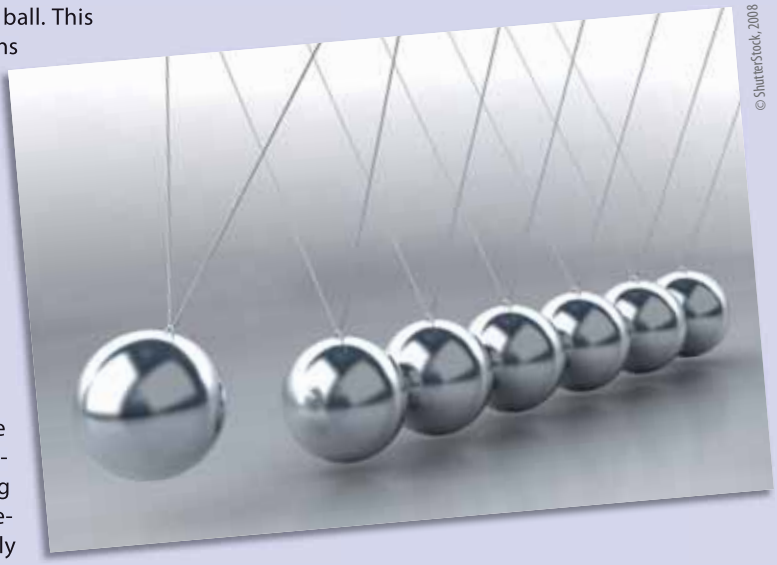
For teachers it may offer a major qualitative upgrade to science teaching, something that is particularly important at a time when interest in science is declining among students of high school age. Teachers were therefore involved with researchers in the design of clearly defined methodologies to be adopted for use of the new science teaching framework in a real school environment.

The final prototypes were applied through an adapted curriculum in schools in four European countries. Subsequently, students and teachers worked together to design their own projects, setting up their own experiments and defining which parameters to measure.

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

Collaboration sought: further research or development support, joint venture agreement.

http://cordis.europa.eu/marketplace > search > offers > 4355



Learning physics through child's play

A 'Laboratory prototype system' (LPS) has been created for 3D positioning. It suits educational applications for indoor or outdoor school experiments and allows for a playful approach to learning the laws of Newton physics.

When it comes to learning physics, children often have difficulty grasping and applying concepts. One way to overcome this challenge is with the constructionist approach to learning which holds that people construct new meaning from current knowledge structures. Hence when applying this theory to children, play is seen as a crucial part of enhancing cognitive development.

The 'Lab of tomorrow' project has adopted such an approach, creating an innovative and concrete pedagogical framework which can support the implementation of emerging technology in everyday learning. Through the LPS, 3D movement of any object within a certain field of view during an experiment or activity can be reconstructed with a high level of accuracy. Since it uses real-life experiments, it serves as a useful educational tool for teaching physics in schools.

The main benefits of the LPS are that its construction is easy to apply and regulate, and that it is accompanied by special software capable of processing the captured data. The system is comprised of cameras that observe the area of the experiment or activity and can record the position of an object (such as a ball) in that location. The course of the object is then recorded, as are any players or additional activity taking place. The cameras are linked to a personal computer (PC) via corresponding ports.

A user-friendly software sub-module operating within the project's software platform allows presentation and processing of the recorded frames. In this way, students may recover the frames which refer to the same time parameter from both cameras onto the PC screen. Following this, the student identifies the object in each frame and marks it using the mouse in order to create the appropriate set of x, y, z coordinates. The software program uses these coordinates to produce the absolute coordinates (xo, yo, zo) of the object. The system was used exclusively in field trials for over a year in schools in Germany, Greece and Austria and had very positive results.

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

Collaboration sought: further research or development support, joint venture agreement, financial support, information exchange/ training, private-public partnership.

http://cordis.europa.eu/marketplace > search > offers > 4341

Real-life robots obey Asimov's laws

European researchers have developed technology-enabling robots to obey Asimov's golden rules of robotics: to do no harm to humans and to obey them.

Issac Asimov, widely regarded as the spiritual father of science fiction, outlined three rules that all robots in his future worlds must obey. The most important two were: a robot may not injure a human being or, through inaction, allow a human being to come to harm; and a robot must obey orders given to it by human beings, except where such orders would conflict with the first law.

However, robotics in the real world has trouble striking a workable balance between these two requirements. Robots can perform tasks efficiently in controlled environments away from humans, or they can interact with humans if properly equipped with sensors to avoid any harm. But that degree of sensing also creates complexity and a lack of robustness to hardware and software failures which, in turn, affects safety. Of course, robots could be safe if they move slowly enough, or work far away enough from humans — but then, their dexterity and effectiveness are dramatically reduced.

'Despite the scenarios science fiction has been depicting for decades of concrete human-robot interactions, we are still a long way from that reality,' says Antonio Bicchi of the University of Pisa's Faculty of Engineering. 'Most robots today can only work safely if segregated from humans, or if they move very slowly. The trade-off between safety and performance is the name of the game in physical human-machine interactions.'

Mr Bicchi coordinates the EU-funded Phriends project to create a new generation of robots which is both intrinsically safe and versatile enough to interact with humans. 'The most revolutionary and challenging feature of Phriends is designing and building robots capable of guaranteeing safety in physical human-robot interactions [pHRI],' the robotics specialist explains.

For Phriends, safety means ensuring no accidents occur, even in the event of programming bugs, sensor glitches, or hardware and software failure. But creating a robot that is both completely safe and can perform useful functions requires what Mr Bicchi calls a 'paradigm shift' in approach.

This involved going back to the drawing board and rethinking how robots are designed and function. 'The classical robotics approach is to design and build robots with a specific task in mind,' Mr Bicchi notes. 'The robots developed by Phriends will be intrinsically safe, since the safety is guaranteed by their very physical structure, and not by external sensors or algorithms that can fail.'

The project has worked on developing new actuators — the devices which move and control the robot — concepts and prototypes, new dependable algorithms for supervision and planning, as well as new control algorithms for handling pHRI. These components are then integrated into functionally meaningful subsystems, and evaluated and tested empirically. The project is also contributing to ongoing international efforts to establish new standards for collaborative human-robot operation.

Before we get carried away at the idea of having android friends and colleagues working beside us at the office or even at home, it should be pointed out that Phriends is taking what could be described as a one-limb-at-a-time approach.

The project's main focus is on robot arms, and the partners have turned to nature for inspiration in developing a prototype Variable Stiffness Actuator (VSA). Just as human and animal muscles move in opposite directions to move limbs, the VSA achieves simultaneous control of the robot arm by using two motors antagonistically to manipulate a non-linear spring which acts as an elastic transmission between each of the motors and the moving part.

One of the Phriends partners, the E. Piaggio Centre for Robotics and Bioengineering at the University of Pisa, Italy, has developed a second version of the VSA which uses a more sophisticated antagonistic concept to move robot joints directly.

'This approach makes the robot arm lighter because its structure is soft when the robot moves fast and can collide with humans, and it becomes hard, or tensed, when performing tasks requiring precision,' describes Mr Bicchi.

Phriends, which received more than EUR 2 million in funding from FP6, has followed both a proactive and reactive approach to accidents. It has designed its robots to anticipate potential collisions with humans and avoid them. But in the unpredictable world we live in, accidents will happen and collisions may occur anywhere along the arm.

Two of the project's partners — the German Aerospace Centre DLR and the University of Rome in Italy — have developed an ingenious solution which, like humans, relies on 'proprioception' to determine the relative position of neighbouring components using special sensors. Such self-awareness enables the robot to react promptly to collisions or crashes and resume safe operations.

But even a rapid correction may be no good if the robot is heavy and solid, as industrial arms traditionally are. Phriends has explored a number of ways to make impacts gentler, including lightweight robot design, soft visco-elastic covering on the links, and mechanically decoupling the heavy motor inertia from the link inertia.

In the greater scheme of things, Phriends is one small step for robotics but one massive leap for pHRI. 'The real challenge for the future of robotics is not to do something shockingly complex, but to do even simple things in a way that is safe, dependable and acceptable to ordinary people, thus making human-robot coexistence possible,' remarks Mr Bicchi. 'The economic impact of safe and dependable robots in manufacturing is huge in terms of simplifying plant layouts, increasing the productivity of workers and machines, and for overall competitiveness.'

The project has already elicited industry interest. Germany's Kuka Robotics, one of the world's leading manufacturers of industrial robots, is a partner in Phriends. Kuka will release a new robot arm in 2008 which incorporates some features developed by Phriends.

Outside the EU, companies in Japan and South Korea, which are also working on similar technologies, have contacted Phriends requesting their assistance in developing new technologies and products.

The technology the project has developed also has potential applications in other fields, including sports training and physical rehabilitation.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90001

Managing maths text for the seeing impaired

A new system has been developed which provides linear access to mathematics for the seeing impaired.

Mathematics text management can be problematic for seeing impaired users at secondary schools and universities as can scientific texts in digital format and Braille print. In light of this, the Lambda project has faced this challenge with the creation of a system based on a linear (textual and sequential) mathematical code known as MathML. Unlike previous codes, it relies on text formatting and representational markers which are easier for the seeing impaired to read and manage through certain peripherals.

The project's structure was made up of two major areas which, although different, complement one another. One involved defining the maths code and the other was developing the editor. The code is made up of a linear mathematical syntax and an 8-dot representation as opposed to the 6-dot previously used. The editor offers instructive written support for solutions of mathematical expressions in 8-dot Braille.

The stages were implemented concurrently and independently. The focus was on software development to arrive at a complete product marketable in all countries involved and adaptable by common management environments of the seeing impaired in Europe.

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

Collaboration sought: licence agreement, marketing agreement, private-public partnership.

http://cordis.europa.eu/marketplace > search > offers > 4377

Database deployment defeating disability deficiencies

Assistive technology for the disabled has become an enormously detailed business, and identifying which device is most suitable for a user, a labyrinth of investigation. A newly compiled database has merged with an established service to provide an easy-to-use, searchable and informative resource for disabled people.

There is a flood of assistive technologies on the market today, ranging from switches to wheelchair appliances, from haptic devices to joysticks and electronic interfaces. Knowing exactly which one is the most useful or best suited for a user has become a nightmare. Although much care has gone into their development, ailments and disabilities are so varied, there is no easy way to find a perfect match.

An EU-funded project, I-MATCH has now combined the I-MATCH database with the SIVA portal hosted by the Italian Fondazione Don Gnocchi. Moreover, it has integrated with the 'European assistive technology information network' (Eastin) to provide European-wide access. With the Italian Ministry of Welfare involved, high visibility and public awareness is ensured.

The database offers new and advanced search facilities, encouraging manufacturers to submit as much detail about their product as possible. This incentive is important, as when more information is available, the choices made are usually more appropriate. The structure of the database is also the first attempt at standardising such information. This constitutes another important outcome as it provides a highly useful interface mask for technical definition. In short, this means more comprehensible information will be made available to users.

Because the database is constantly and consistently updated, the newest information becomes immediately available. A spin-off benefit to this is that there in an inherent assessment facility in place as users can now, for the first time, compare products.

Overall, the migration to the SIVA portal has proven highly worthwhile, as its integration, facilities and detail ensure that it meets a variety of targeted objectives as well as a range of end-use purposes. For example, manufacturers can use the database as a means of advertising their products, and since a wide public audience is reached, proffer testing opportunities to their users for feedback purposes.

All in all, the migration and development has proven its worth and should offer everyone involved the means to make better decisions to improve both their quality of life and the developed product.

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 > 4375

Paying for parking by mobile phone

The days of parking fee hassles may have come to an end, thanks to an innovative system allowing payments to be made by mobile phone.

Parking can be stressful enough without needing to fret over payment methods. The Miracles project has presented a mobile phone-based parking payment scheme. This system allows interested users to register through a company called Park-by-Phone (PbP).

Once they are registered, they can deposit a minor sum of money into their PbP account which is drawn from each time they use the service. Users receive a barcode from PbP which is to be affixed to their vehicle. Furthermore, they can receive a reminder 10 minutes prior to the expiration time so that they may either make an additional payment or remove the car accordingly.

This new system is not only useful for those with cars but it is also helpful for traffic wardens. This is because wardens have been issued handheld devices which are able to scan PbP barcodes, providing them with automatic feedback about parking payment status.

Since the initial use of PbP in the city of Cork, Ireland, user surveys have indicated a very high satisfaction rate. Due to this positive response, its use has expanded beyond the city's centre to 120 suburban streets. Besides being easy to use, the new system has the added benefit of lessening the need for parking discs, thus reducing both financial and environmental costs.

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

Collaboration sought: licence agreement.

http://cordis.europa.eu/marketplace > search > offers > 4317

Dashing computer interface to control your car

European researchers have developed a special dashboard computer to act as a single conduit for all devices emerging in modern cars: global positioning systems (GPS), mobile, personal digital assistants (PDAs), and intelligent car technologies. It should mean a better, more relaxed and even safer driving experience.

European research and the automotive industry have joined forces and developed a dashboard interface that can link and control the increasing information and vehicle control systems currently emerging in the automotive industry.

Right now, dozens of research projects around Europe are working on new technologies to improve automotive safety and to develop intelligent vehicles. But all of these systems must then be added to the dozens of controls and user devices that are already found in a car.

Current in-vehicle systems like open door and seat belt warnings will soon be joined by lane assistance, hazard detection and a host of other information and systems for safe and efficient driving.

'There is a real risk the driver will become overwhelmed as the number of in-car systems multiply,' warns Angelos Amditis, dissemination manager of the EU-funded AIDE integrated project. 'There are so many potential demands on driver attention from these new systems that they could prove distracting.'

AIDE was set up to tackle this potential problem by developing an 'Adaptive, integrated driver-vehicle interface' (AIDE). The AIDE system provides a clearing house for all of the systems operating in a car and to interact with the driver.

This central intelligence can prioritise and emphasise the most important and urgent information based on the driver's state and current driving conditions, and it can put all other non-essential alerts on hold.

AIDE designed the technology to prioritise demands on the driver's attention depending on driving conditions. If the car is approaching a tricky junction, for example, it can hold all mobile calls and text messages, or suspend non-safety critical information.

The AIDE system can support many different functions. It helps to ensure that drivers get the best possible use out of those functions, and that the system is safe and easy to use.

It works by sharing input and output controls among the various subsystems, such as collision avoidance or the mobile phone unit. It then coordinates information centrally, deciding the best course of action for both a given driving situation and the driver's current state.

If the driver is distracted, for example, the system issues warnings with greater intensity. AIDE also developed the interface so that it could adapt to different types of driver. It is possible to personalise the warning, the media, timing and its intensity according to the driver's profile, both explicit and implicit preferences, explains Mr Amditis.

AIDE was popular among drivers in field tests, with approximately 50 % of the test subjects reporting that they appreciated support from the system. That is a surprising result, really, given that many drivers find in-car systems — like seat belt and door warnings — maddening, and it is very difficult to develop a comfortable interface.

But AIDE succeeded in developing helpful software rather than what could easily be annoying nagware.

The positive field response is a tribute to the studies and testing undertaken by the AIDE project. 'We consulted drivers and experts, and a lot of literature about driver response to safety systems, using a user-centred design approach,' notes Mr Amditis.

AIDE also looked at quantitative models and simulation, which may ultimately provide a cost-effective system for testing. The perfect quantitative model remains elusive for now, but AIDE did develop a 'cookbook' for human-machine interface (HMI) testing in the automotive industry.

'The project also raised awareness in Europe about the importance of interface issues for road safety, and AIDE has put in-car HMI on the agenda in Europe,' explains Mr Amditis. 'Many of our partners will continue AIDE's work, adapting elements of it to their own cars and trucks, while many of the equipment manufacturers are looking on AIDE-like systems to be implemented in their vehicles.'

'There might be a move towards some standards over time, but in the short term manufacturers will deploy proprietary implementations,' he adds.

Mr Amditis says that the partners hope to continue the work in future projects. 'Right now we are putting the finishing touches to our reporting and dissemination work in AIDE, but we will be pursuing new research initiatives after that.'

The AIDE project received funding from FP6 for research in information society technologies (IST).

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/89989

See also page 39 (Tackling traffic's biggest killer)

Simultaneous use in wireless communications

In order to improve wireless communications reliability and capacity, different diversity techniques have been utilised in the past, bringing significant performance improvements by minimising detrimental effects of fading channels. When combined, more possibilities can arise for efficient information transfer and therefore leaving room for further performance improvements.

The remarkable benefits for end-users and service providers of wireless communication systems with antenna arrays at both transmitters and receivers has motivated research work conducted within the FLOWS project. To enable the full range of interactive services like e-mail, multimedia messaging, Internet browsing and wireless positioning, reliable and fast transmission of information over the air is required. These so-called 'multiple-input multiple-output' (MIMO) systems have already been shown to yield tremendous capacity, which grows at least linearly with the number of transmit and receive antennas.

Aiming to enhance the MIMO up-link designed to operate under third-generation cellular standards, new multi-user interference cancellation techniques have been proposed by project partners at the University of York. Based on estimates of each user's modulated signal and channel noise, the desired received data was sought to be more accurately and, importantly, simultaneously evaluated by subtracting the undesired interference. For this purpose, they were interested in combining the benefits of forward error control coding with the information capacity of MIMO channels.

With only limited increase in decoding complexity, space-time turbo-coded interference cancellation enabled a large, systematic increase in coding gains while preserving the performance advantages of MIMO channels. Merging appropriate channel coding with antenna diversity at each end of the uplink, the multi-user detection scheme proposed has been proven to be effective for combating co-channel interference. Moreover, residual interference could be suppressed in each iteration, leading to an increase of the MIMO system's capacity.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4345

Frequency control in electronic devices

For efficiently separating different frequency bands within the cells on which wideband, high-data-rate wireless communication networks are based, innovative tuneable microwave filters have been developed by the TUF project partners.

The wireless communications' revolution has led to the proliferation of handheld, wireless devices, such as mobile phones freeing the user from the cord. Ceramic materials, which can serve as dielectric resonators storing and transferring microwave communication signals, have a crucial role to play in this revolution.

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Very few ceramics possess the essential properties for forming thermally and mechanically stable dielectric resonators with quality factors comparable to cavity resonators. Furthermore, low-loss materials are highly desirable for frequency tuneable dielectric resonator filters used in the base stations of mobile communication systems.

By modifying the electric field of the dielectric resonator, their resonating frequency can be adjusted. To broaden their use in mobile communication systems, researchers at the University of South Bank in London evaluated different methods for rapidly tuning dielectric resonator filters.

In an attempt to improve the tuning ability of dielectric resonators, they devised an innovative method for fast tuning. A ferroelectric element, comprising a thin ferroelectric film mounted on conductive substrate made of silver or other metal with a high melting point was added around the dielectric resonator. When applying a direct current bias, the permittivity of the ferroelectric film decreased and hence the dielectric resonator's electric field could be changed.

An alternative approach included a piezoelectric element connected to the moveable conductive component of the resonator's cavity. When voltage was applied to the piezoelectric element, preferably a bimorph, its dimensions would change and subsequently the resonator's frequency would be adjusted as conductive components moved.

The results were encouraging with patent applications arising from the research work on both ferroelectric and piezoelectric tuning.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4329

Testing computer grid performance

The computing capabilities of a cluster of computers, a grid, can now be tested at individual selected computer kernels. With the performance prediction component tool the user can establish real and predicted performance of the grid.

A grid is a collaboration of a number of computers. The performance of this collaboration can be compared with the synergy of an orchestra. Computers performing separate individual tasks are at the same time producing a global task. Summing computer capabilities while decentralising allocation of tasks enables handling and manipulating large amounts of data. Moreover, data can also be geographically dispersed.

Exceptional system requirements are demanded in numerous scientific fields. Computer grids are used extensively in high- energy physics experiments, in weather forecasting and for risk and crisis management of physical hazards. Moreover, grids enable simulation and visualisation of surgical procedures and have facilitated effective environmental controls. The Crossgrid project has developed and exploited grid components for data intensive applications. The project has implemented a grid across 11 European countries.

continued on page 35

Printed optical electronics come into view

European researchers have taken a major step towards the goal of developing printable electronics that can be used for creating radio frequency identification tags and flexible watch displays.

Researchers have long dreamed of being able to print electronic components directly onto organic materials such as paper, fabrics, or plastic. In addition to being able to fabricate large numbers of everyday devices such as watch displays and other applications cheaply, they envision novel applications including electronic paper, eyeglasses with embedded displays, or even smart clothing.

Researchers in the EU-funded Contact project have demonstrated that with suitable inks and printers, organic liquid crystal displays and other optical electronic devices can be printed out precisely. The Technical University of Ilmenau, a Contact partner, has shown that within the printing process patterned glass plates can be used.

The project researchers hope to follow this proof-of-principle by developing a state-of-the-art gravure printing press, called 'Labratester 2'. The press will be able to print hundreds of thousands of organic thin film transistor (TFT) arrays or other devices precisely and efficiently.

'Labratester 2' is currently being finalised by Switzerland-based Schläefli Machines, another project partner. The company's challenge is to perfect the extremely precise machinery needed to correctly align the layers of materials needed to form arrays of organic TFTs and other circuit elements.

Project coordinator Alan Mosley says that the most challenging problem the project team encountered was when they tried to lay down the first layer of a liquid crystal display over the TFT array they had already printed.

'What we found was that when we put down the first layer associated with the liquid crystal manufacture, it destroyed the TFT layer,' he says. 'You have to use aggressive solvents, which attack organic materials.'

Project researchers at the Imperial College London eventually found ways to modify the inks and other materials making up the TFT layer so as to resist the solvents. The result is a process for printing a TFT layer that is compatible with a liquid crystal display.

Mr Mosley also credits consortium partner IMEC in Belgium for research leading to the special ink formulations used to print the electronic components.

The group's next challenge is to replace their current printing platform, 'Labratester 1', with the more sophisticated 'Labratester 2'. Although both presses are capable of printing the tiny structures needed for optical electronics — 25 micron features with 25 micron spacing — 'Labratester 2' will be able to align sequential layers with 10 micron precision.

'You want to put down one layer and then lay the next one on it in a precise position,' Mr Mosley says. 'But "Labratester 1" simply wasn't equipped to do that.' He explains that 'Labratester 2' will use optical cameras to detect alignment marks in order to register each layer precisely over the previous one.

Contact, which was funded under FP6, drew together the expertise of leading academic and industrial partners from Belgium, Germany, Switzerland and the United Kingdom. In addition to fabricating the printers, the researchers made advances in formulating, synthesising and testing new materials, glass technology and thin films.

Although the 42-month long project has now ended, two of the project partners, Schläefli and Asulab, have opted to complete and test the 'Labratester 2' printer. Switzerland-based Asulab, which is part of the Swatch Group, plans to use 'Labratester 2' to print LCD watch displays.

'There may be opportunities for some clever designs,' says Mr Mosley. 'A glass display has to be rectangular or square, but with plastic you can cut it to any shape you want.' Mr Mosley expects that 'Labratester 2' will stimulate the entire organic electronics sector.

'As far as I'm aware, it will be the most advanced bench top gravure printer available worldwide,' he says. 'There's been a lot of interest in it from laboratories and R & D groups. When you look around the world, there are a lot of people interested in organic electronics.'

'Labratester 2' will be capable of printing only moderate numbers of devices at a time, but the advances that have gone into it can be transferred to faster machines. 'What we feel is that the machine will evolve into something that could do millions of copies of a certain item per year,' concludes Mr Mosley. 'It has that potential.'

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/89831

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continued from page 34 **'Testing computer grid performance'**

Grid programmers and resource brokers will greatly benefit from the innovative Performance Prediction Component (PPC) tool, developed by the Crossgrid project partners. The tool is capable of assessing the performance of selected computational kernels and provides information on programme behaviour under various grid scenarios. Furthermore, the tool is equipped with a graphical user interface. The interface aids the user in assessing the features of the grid and consequently simulates these effects on parallel kernels.

Knowledge of grid behaviour is also very important for academic institutions and widespread usage of the performance prediction tool is expected.

Monitoring grid application performance results in efficient distributed data access and better resource management.

Crossgrid project partners have made available the prototype code of the performance prediction component for testing by grid programmers.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4179

Quantum studies produce potential solutions

In this modern era in which information is wealth, communication systems are more than key — they are vital. In the realm of improving communication systems, quantum theory and research has taken on such significance — it could be considered the leading research area.

The EU-funded project RESQ set out to accomplish more than just ground-breaking research; the partners aimed to provide the entire arena of quantum mechanics as an invaluable resource. The purpose of their publications, aside from disseminating information and assisting further advancements in the field of quantum studies, was to establish and contribute towards much-needed resources for quantum researchers.

Of particular interest was their investment in multidisciplinary networks (physicists, computer scientists, mathematicians and statisticians) in order to understand how quantum information could be manipulated in small-scale systems. In this regard, further development sought to design improved techniques both to investigate the estimation of quantum states and quantum dynamics.

According to quantum theory, there exists a state called 'quantum entanglement', meaning that combined systems can in fact have additional properties. As such, further studies to characterise quantum entanglement as well as to identify the resources needed to conduct quantum information processing were undertaken.

The project also highlighted other key findings, such as those related to making advances in quantum cryptology including key distribution, coin tossing and string commitment.

Additionally, other new results were obtained for classical problems, such as how quantum communication can reduce communication complexities. Other solutions were also found during the project's duration, namely finding new quantum algorithms for some cases of the hidden subgroup problem.

Research and development from this project produced viable and ready-to-patent concepts and protocols.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4356

Multiplexing configurations for optical seismometers

Low-cost seismometers were developed for use in the field. The Optsdet project has created a new generation of optics-based seismic sensors and measurement techniques.

A number of multiplexing techniques were investigated and a system developed using low-cost optoelectronic components. A sensor was created which uses the 1 300–1 500 nm wavelengths. The sensors operate on three axes: north-south, east-west and up-down. They have improved resolution and dynamic range, providing researchers with more accurate measurements. The signal to noise ratio was also dramatically improved between the sensors and the data loggers. The project replaced the complex mechanism of classical sensors with sophisticated electronics. All prototypes were calibrated in dedicated laboratories and tested under field conditions for the measurement of seismic activity.

In order to enable a wide dynamic range, two types of sensor were created: one optical accelerometer of low resolution and the other of high resolution. A polarisation diversity receiver (PDR) was used for each of the low- and high-resolution sensors. This dramatically reduced polarisation signal fading. The sensors' wide dynamic range was also allowed by multiplexing the light from their laser source.

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 > 4102

Beyond bits

The prospect of nature being coherently controlled and manipulated at the quantum level has been both a powerful stimulus and an intriguing challenge faced by the Quprodis project.

Information processing is currently implemented using quantities such as charges, voltages or currents in electronic devices which operate on the basics of classical physics. More specifically, conventional computers perform calculations on fundamental pieces of information called bits, which can take the values of 0 or 1. On the other hand, quantum information processing promises to employ the laws of quantum physics.

A number of technologies are under investigation for their suitability to implement a quantum computer that uses quantum bits (qubits), representing both values of 0 and 1 at the same time. Research on quantum information processing needs therefore to be highly interdisciplinary and coordinated efforts led to the creation of a diverse consortium made up of the 15 Quprodis project partners.

For a quantum computer, basic gate operations will be provided by logical operations on individual qubits and controlled coherent interactions between two qubits. As a fully theoretical project, Quprodis focused on information processing and transmission by controllable and distributed systems (atoms and molecules), exploiting quantum mechanical operations and new quantum algorithms.

From the beginning of the project, new ideas emerged in connection with quantum coherence and entanglement, although theoretical work may be far ahead of experimental realisation of these ideas. Secret correlations are already an important resource in classical cryptography, where sender and receiver hold identical code books whose contents are only known to them. Entanglement, as a novel form of such secret correlations, will be a key resource in communication scenarios between distant laboratories.

The transfer of concepts from quantum information theory to other fields of theoretical physics such as condensed matter physics, or quantum field theory has also proved fruitful. Research work done within the Quprodis project was undoubtedly state of the art in several theoretical fields, providing a benchmark for possible future applications.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4384

Keeping computing compatible

As distributed computing becomes universal, the programs that make devices work really have to work together. European researchers have gone back to basics to create a development toolkit that guarantees this sort of compatibility.


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Early in 2006, an EU-funded research group called Semantic Interfaces for Mobile Services (SIMS), took on the challenge of how to envision, design and develop the next generation of software to power widely distributed and highly interactive devices.

The result — a suite of tools for speeding the design and validation of software and services that are guaranteed to interact smoothly — is now being applied and tested by a team of developers.

When SIMS-inspired services are widespread, explains Richard Sanders, the SIMS project coordinator, devices such as smart phones, personal digital assistants (PDAs) and computers will interact with each other seamlessly, update themselves automatically and offer users the ability to implement new services that are guaranteed to work from the start.

'If you have communicating software and the communication is important, you want to make sure it works when it interacts with other software,' says Mr Sanders. 'SIMS provides the tools to check those scenarios and actually guarantees compatibility.'

The SIMS researchers based their approach on two key factors that they felt had previously been neglected. Communication and computation are becoming increasingly collaborative and, at the same time, the programs and components that make the devices that we rely on to work are becoming increasingly autonomous.

To accomplish a goal as simple as delivering a package, multiple agents using a wide range of fixed and mobile devices must exchange a variety of messages. For the package to get to the right place at the right time, every exchange has to produce the desired result.

So, the software components making all those interfaces work have to be compatible. Unlike a telephone call, where one device attempts to initiate a particular kind of connection with another, most real-world services now involve many loosely interconnected software components running on a variety of devices initiating complex sequences of contacts and utilising many different messaging modes.

Most developers, notes Mr Sanders, still think in terms of a single client and server, where one component takes the initiative and the other responds. 'We find this very limiting,' he says. 'We're used to lots of components whose combined behaviour produces a service, and where many of them can take the initiative.'

To reach their goal, the SIMS researchers had to re-examine the process of service development from the ground up. 'The biggest challenge was to understand the basic concepts and find the right way to explain them to ourselves and others,' says Mr Sanders. 'Concepts like what is a service, what is a goal, what is a semantic interface, and how do these relate to software?'

One result of their back-to-basics approach is that the development of a new service starts with a model of what that service should accomplish rather than with computer code. The model uses semantic interfaces to specify what goals need to be realised and how the components of the system need to behave and interact to bring that about. Semantic interfaces detail, in a highly structured way, what kinds of connections, exchanges and results are meaningful and useful within a particular domain.


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Crucially, the ability of components to communicate with and understand each other can be checked within these models, rather than after reams of computer code have been written. 'We can validate that nothing goes bad; that you don't send me a message that I won't understand,' says Mr Sanders.

Developers can create computer code to run devices directly from the validated models, code that is guaranteed to work with all the components of the system.

The researchers believe using their approach and tools could head off most of the interaction errors that trip up systems and frustrate users. In addition, devices could detect when new or improved services become available, and update themselves automatically as they interact without the risk of introducing incompatible software.

Mr Sanders is eager to see SIMS used wherever interactive services and the software that makes them work are being developed. The result he envisages is a dynamic, service-oriented market place that would work far more smoothly and efficiently than today.

'The greatest potential lies in the way it can support a market place with lots of people specifying services and lots of companies making components that implement these services,' says Mr Sanders. 'This market place would support the spreading of software in a much more efficient way than you currently see, and without quality and compatibility problems.'

The SIMS project received funding under the ICT theme of FP6.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90077

Recycling glass and carbon fibres

Glass and carbon fibres contained in composite materials are valuable products that are worth recovering for other uses. New recycling solutions for waste composite materials were identified and tested within the REACT project, with the aim of finding use for the end products in industrial applications.

Enhancements of fuel efficiency are strongly needed to reduce environmental burdens in the transport sector. Engineers have thought of switching from conventional steel to light metals such as aluminium and even advanced composite materials. In particular, glass and carbon fibre-reinforced plastics (FRPs) have attracted much attention because they have such high strength and rigidity.

KEMA Nederland BV initiated the European research project REACT to improve the potential of recycled composite waste materials in reinforcement applications. The high cost of composite raw materials, inhibiting the widespread use of FRPs was sought to be addressed by recovering fibres from waste and end-of-life products.

Most of the waste generated by the use and manufacture of glass- and carbon-based composites that have almost infinite life is currently disposed in landfill sites. As European regulations now limit landfill disposal, producers of FRP products, a recycling company and research institutes joined their forces to develop advanced recycling technology for FRPs.

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Project partners used the currently available recycling processes as a basis to make a major leap forward and lower the productions costs of FPRs. A variety of composite waste materials were tested with the aim of identifying and ultimately tackling the drawbacks of the waste collection system. Recyclates of a higher value could be produced by means of a fit for the purpose of size reduction and surface activation treatment. During the composite materials' disintegration through pure mechanical granulation or pyrolytic cracking, the plastic surrounding reinforcing fibres could be separated and subsequently used as active filler material.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4326

Pneumatic valve for reducing corrosion in pipe organs

Europe's historical organs are threatened by corrosion of the metal pipes. A pneumatic valve helps prevent damage by ventilating the instrument's wind system.

The pipe organ is an important part of Europe's cultural heritage. Unfortunately, this noble instrument is now under threat. The lead and lead-alloys used in the organ's pipes have been severely affected by indoor atmospheric corrosion. In order to combat this situation, the Collapse project has developed conservation strategies. These have included changing the environment to prevent corrosion in pipes.

Organic acids are emitted from wood used in the construction of the organ's windtrunk and windchest. Traditionally, oak has been used in pipe organs. Unfortunately, oak is noted for emitting large amounts of organic acids, especially acetic acid. The temperature and humidity inside the instrument also affects corrosion by influencing the emission rate and corrosion process itself. Techniques and products have also been developed to clean corroded pipes and to protect those pipes already under threat, from further corrosion.

The Collapse project has developed a pneumatic valve that can be installed in the organ. The valve automatically ventilates the instrument before it begins to play, removing air laden with accumulated organic acids. The project carried out field studies on selected corroded and non-corroded organs in Belgium, Germany, Italy and the Netherlands. The historical Stellwagen organ in St Jakobi church, Lübeck, was severely corroded. The Collapse consortium fitted four valves to the windchest in order to rectify the situation.

Organ builders, restorers and owners have now been made aware of the valve through conferences, seminars, written articles and the project website. The knowledge and skills developed through the Collapse project will provide cultural institutions, parishes and SMEs new tools for safeguarding Europe's cultural heritage by preventing pipe corrosion. The project website is available at: http://www.goart.gu.se/collapse

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

Collaboration sought: available for consultancy.

http://cordis.europa.eu/marketplace > search > offers > 4152

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Tackling traffic's biggest killer

Each year, over 40 000 people meet their end on Europe's roads in car accidents. It is the equivalent of several small-scale wars. The biggest killer is head-on collisions, with 6 000 casualties annually. But now, new car and road technology developed here could bring peace to Europe's roads.

It is the most powerful impact a car can suffer and it is very difficult to predict or avoid; twin fatal factors that make head-on collisions the most devastating killer on the continent's roads. Of the 40 000 people who meet their tragic end on Europe's roads and streets each year, 20 % are head-on collisions.

In many ways, that is just the horrifying beginning. Head-on collisions are more likely to lead to multiple car pile-ups, they demand huge rescue efforts, and they lead to more serious, lifelong injuries too.

These shocking facts demonstrate the desperate need to improve safety on Europe's roads. Tackling traffic's biggest killer is one of the key aims of the EU-funded Prevent project.

Prevent is the biggest research initiative into road safety ever launched on the continent. It is big in every sense: 54 partners, a EUR 55 million budget and dozens of major projects covering every aspect of road and car safety. But the biggest impact will be the lives saved. This is already happening, with life-saving technologies developed by Prevent continuously entering the market.

It has over a dozen major sub-projects focusing on almost every aspect of road safety, creating a virtual safety belt that encompasses the whole car. Take the Safelane and 'Lateral safe' sub-projects. The first supports lane changing, while the second alerts drivers to cars, motorcycles or pedestrians in the blind spot.

Yet another, Intersafe, deals with safely turning at intersections, while a series of related passive safety projects protect vulnerable road users like cyclists and pedestrians, and mitigate the impact of crashes when they do occur. Apalaci, for example, is the 'Advanced pre-crash and longitudinal collision management system', while Compose can even apply the brakes before the driver can react. And Usercams can spot obstacles, or people, in front and obliquely.

One project, called Preval, also looks at the impact of these technologies. It is building a reliable test of the impact a new system might have on lives saved in the real world. It can track benefit against cost and the simplicity of a system, offering insight into the greatest returns — a vital tool for policy-makers.

MAPS&ADAS developed a warning system using enhanced satellite navigation maps to tell the driver of upcoming hazards — like intersections, blind turns, and dips in the road. It has huge potential, and should appear in cars in the next two to three years.

Others, like Insafes and Profusion, integrate various sensors so they cooperate, offering greater functionality at the cost of software development, which is very cheap to make and easy to deploy. The upshot? Total functionality becomes greater than the sum of its parts.

'Not only will this help make Europe's roads safer, it will make the car makers and ancillary industries enormously competitive,' explains Matthias Schulze, coordinator of the Prevent and Senior Manager for ITS & Services at Daimler AG.

All Prevent projects feed into each other in some way, and nowhere is this more important than in head-on collisions. But two projects focus closely on traffic's biggest killer.

Saspence deals with safe following distance and speed, using long-range sensors and map data. It also integrates with another vital project, Willwarn, which promotes car-to-car wireless communication to warn you and other drivers of oncoming traffic or hazards, like black ice, up ahead.

Saspence uses long-range sensors to assess the distance to the car in front and tracks this against your speed and the safe braking distance. This can have enormous impact.

Studies show that driving just 1 km/h faster in dense traffic will increase the probability of an accident with injuries by 3 %. The difference seems small, but with over 260 million vehicles on Europe's roads, tiny changes make a big difference. Prevent tested the Saspence system in two demonstration vehicles.

Willwarn is even cleverer and ushers in a new era of traffic safety. It can detect potential road hazards using data from various in-vehicle systems, such as the automatic breaking systems (ABS), and inform other vehicles about these hazards via WLAN-based communication. On the one hand, Willwarn maps nearby vehicles, and on the other it can send or receive information about upcoming road conditions. The system was tested in BMW's 520i and 120d, Mercedes A 200 and S350 and the Smart Fortwo.

Prevent also tested the system using its Preval assessment scheme and both were effective, Willwarn especially so. They proved popular with drivers, too. The technologies, particularly Willwarn, could appear in cars in the next two to three years.

This practically demonstrates the impact of Prevent and its raft of sub-projects. If that is not enough, Prevent has ties with a host of other European projects, including EASIS, Aprosys, AIDE and many others. It also links with Europe's 'Intelligent car' initiative and its safety programme. Prevent's work even became a flagship demonstration of the 'Intelligent car' initiative.

It might seem like overkill, but in 2001 Europe pledged to cut traffic fatalities by 50 % in 2010. A tough target, and one that will need all the help it can get.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/89636

See also page 33 (Dashing computer interface to control your car)

Temperature sensor for environmental monitoring

There is a growing awareness of the effect of pollutant gases on people and the environment. This has resulted in the development of new, safe, reliable and low-cost sensors that are suitable for use both in the home and in the workplace.

The increasing use of natural gas heating systems in homes and offices has meant that there needs to be constant monitoring for harmful gases such as carbon monoxide. Furthermore, the spread of landfill waste sites throughout the EU has led to a rise in the amount of methane gas being released to the environment. The result has been greater levels of pollution and the possibility of explosions.

The Nanophos project successfully created prototype sensors. This was the result of a successful integration between science and technology, with strong backing from industry. The aim was to produce an exploitable product within 5 to 10 years.

A second generation of prototype sensors was developed, which includes a temperature sensor. Researchers designed a basic platform which used standard off-the-shelf components. It could be employed as the electronic processing end for the whole range of Nanophos gas, temperature or relative humidity sensors.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4340

New nozzle unlocks potential of alternative fuel injection

A new injection nozzle developed by Delphi Diesel Systems in the United Kingdom will help put cleaner diesel-burning vehicles on the road.

Diesel-powered heavy-duty vehicles are a significant source of air pollution. The European Commission is setting increasingly stringent emission standards (for example, Euro 5) in order to combat this problem. The task facing the automobile industry is to reduce these harmful emissions without compromising fuel efficiency.

Delphi Diesel Systems and five other partners took up this challenge in the framework of a Growth programme's RTD project entitled HY-SPACE. They focused on the potential of a special fuel injection system (FIS) known as homogeneous charge compression ignition (HCCI). Ignition is initiated by extremely high pressures in HCCI engines rather than by spark in conventional internal combustion engines.

The British engineers determined the nozzle specifications for HCCI engines suitable for heavy-duty applications. Parameters such as pressure, flow, nozzle geometry (number and size of holes) and spray pattern were defined. An investigation of valve inflow and outflow was also carried out.

The resulting design, which incorporates 24 injection holes, achieves the narrow cone-shaped spray pattern necessary for optimal performance while minimising emissions. The prototype also proved extremely durable during testing at pressures up to 2 000 bar.

The HY-SPACE consortium, which includes several auto manufacturers, will explore the possibility of integrating the new FIS technology into future vehicles. Delphi Diesel Systems is also planning to target the original equipment manufacturers (OEM) market.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4367

Understanding the perfect powder

A new process of thermal spraying has been shown to improve composite structures on surfaces. Research into powders used for the purpose aims at enriching the understanding and characterisation of powder performance.

Composite materials have a large role to play in the application of coatings. Thermal spraying gives a material strengthening properties and heat resistance capabilities. This process involves injecting powders at enormous velocity and temperature into a flame jet and propelling them in a stream of gas onto a substrate. Here, the particles flatten onto the surface material, bond and solidify, thus imparting their intended characteristics.

As exciting as it sounds, much of the process is based on the theoretical understanding of specific powder properties and on physico-chemical principles. While theory is important, the EU-funded project Nanospraying investigated means of testing through extensive, tightly controlled experiments. This was to further develop and characterise thermal spraying powders created from agglomerated nanocrystals.

To do so, coatings were tested using X-ray diffraction (XRD) and scanning electron microscopy (SEM) investigations. With these, the characterisation of microstructural properties was made, and this resulted in the key development of important metallurgical principles that can be used in thermal spraying.

The data accumulated in this research promises to bear fruit, specifically when associated with similar research from related projects. Moreover, since the research confirmed that the nanostructures achieved using thermal spraying have better performance ratios than conventional coatings, considerable breakthroughs are expected.

Since so many industries use composites, in particular for surface quality improvement, this process, along with the understanding of powder performances, is sure to have enormous impact.

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

Collaboration sought: information exchange/training.

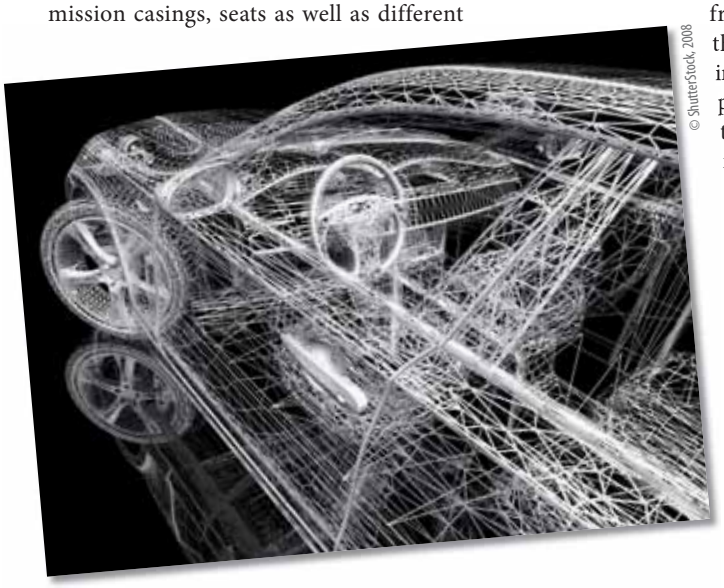
http://cordis.europa.eu/marketplace > search > offers > 4351

Magnesium taking on aluminium and steel

In order for magnesium (Mg) alloys to gain a foothold in automotive applications, where a number of parts are currently made of aluminium and steel, clean and environment-friendly nanocomposite coatings have been developed. Replacing hazardous chromium (Cr)-based coatings, this viable alternative is more economical while offering superior resistance to corrosion and abrasion.

Reducing the weight of motor vehicles is among the primary means of decreasing their fuel consumption thereby cutting down the output of exhaust emissions. Mg alloys — lighter than aluminium and steel — are especially attractive in order to reach the lowest weight targets set by the automotive and aeronautical industries.

Vehicle parts most suitable for the application of Mg are steering wheel cores, transmission casings, seats as well as different supports and brackets. Research in the context of the Nanomag project aimed to address the Achilles' heel of these otherwise versatile materials, their susceptibility to corrosion and staining.



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Traditionally, Mg alloys have been protected with environmentally problematic treatments such as Cr-based coatings. The development of new corrosion resistant coatings, using clean and environmentally friendly processes is therefore of strategic importance for European industry due to health, in addition to economic, considerations.

Researchers at the Università di Bari in Italy explored the possibility of depositing void-free, well-adherent thin films on Mg alloys by plasma enhanced chemical vapour deposition (PECVD). These coatings have been produced at the floating plasma temperature (< 70 °C), by applying an electromagnetic field to a gas mixture containing organosilicon monomers (hexamethyldisiloxane, HMDSO, and tetraethylorthosilicate, TEOS), oxygen and argon.

More specifically, to evaluate the transferability of the PECVD technique to the automotive industry, Mg alloy frames of real automotive parts coated, assembled and painted were submitted for corrosion tests. The protective effectiveness of thin silicon dioxide (SiO_2)-like films was investigated by means of electrochemical impedance spectroscopy and salt spray corrosion tests.

PECVD proved to be an attractive surface modification technique which gives rise to minimal atmospheric emissions and waste production. From the overall experimental results, plasma pre-treatment processes had a positive influence on the electrochemical behaviour of the deposited SiO_2-like films. On the other hand, Mg alloy frames plasma pre-treated and coated with SiO_2-like films showed significant improvements in their corrosion resistance.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4305

Advanced mass biomechanical sensing

The Nanomass II project work led to the fabrication of compact, ultra-thin and sensitive metal cantilevers, which possess ideal characteristics for mass sensing environmental or biochemical applications.

With the aid of emerging nanotechnology processes and techniques, the Nanomass II project exploited complementary metal-oxide-semiconductor (CMOS) circuitry technology for the generation of mechanical mass sensors. The novel sensors are based on an array of nanometre scale silicon cantilevers and can be used in environmental or biochemical applications.

Innovative nanolithography techniques and novel silicon-on-insulator (SOI) substrates were employed for the nanocantilever fabrication. Laser or atomic force microscopy (AFM) nanolithography were exploited for optimisation purposes. On the other hand, electron beam lithography and nanoimprint lithography were adopted for assessing reduction in dimensions and increase in throughput.

The introduction of the SOI substrates in the semiconductor fabrication by replacing bare silicon substrates was to improve the performance and shrink the geometry of the cantilever. Demonstrators of ultra thin aluminium (Al) nanocantilevers were realised and characterised for mass sensing applications. The fabrication involved a negative ultra violet lithography step and characterisation was completed with the aid of a scanning electron microscope.

The fabrication process is CMOS compatible and inexpensive allowing full control of the cantilever's thickness at the nanometre scale. In comparison to single crystal silicon cantilevers, the Al nanocantilevers feature high mass sensitivity and may have useful applications in the field of mass sensing. For further information on the project, please visit: http://einstein.uab.es/_c_nanomass

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3917

Weld materials at high temperature

Pressure to improve the efficiency of new power generation facilities as well as extend the life of existing ones was the driving force for the Weldon project that recognised welded assemblies as the main cause of failure.

Reliable maintenance of thermoelectric power generation plants would be impossible without the advanced design of complex pipe systems. Novel materials that can withstand high temperature have contributed to their enhanced thermal efficiency. However, the performance of pressurised high-temperature components is governed by creep related failure of local connections.

Improving the current understanding of welded components' behaviour under creep conditions was one of the main objectives of the Weldon project. Experimental testing methods were employed to demonstrate the effects of weld's geometry and materials' properties, and to generate essential data for the validation of life estimation techniques. Actual high temperature components or realistic models were, for this purpose, tested under conditions identical to those in service.

With the use of finite element (FE) methods, complex models were generated to predict the rupture strength of cross-weld specimens and assess the impact of creep deformation on end-loaded pipes. The in-house code, developed at the University of Nottingham, is an extension of commercial finite element analysis codes with user-defined subroutines that incorporate appropriate constitutive laws for continuum damage mechanics.

Continuum damage mechanics has been proven to be a valuable tool for the determination of material deterioration and creep processes' influence on the tolerance of pre-existing defects. These models of the creep response can provide a better intuitive insight into weld weakening and possible failure modes, and importantly, give a quantitative description of possible solutions. Enhancing current knowledge of welds' behaviour, they may ultimately promote the harmonisation of design and assessment procedures.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4383

Wind turbines and the design challenge

The performance of the wind turbine is dependent on its design and reducing associated uncertainties is a way of improving the machine's efficiency. To achieve this, a sophisticated wind tunnel model was tested and during the final stage of the project, the results were interpreted and then organised into a database.

Turbines are becoming a more commonly used source of alternative energy. Wide-scale investment into turbines has been observed across the EU and it is now common to see the elegant wind turbine structure watching over even the most remote of European landscapes.

Increased popularity of the turbine motivated the Mexico project to conduct various motor rotor experiments. The challenge was to improve the reliability of the machine and its design; this is particularly important for offshore turbines.

The experiment took place in the largest wind tunnel in Europe, located in the Netherlands. The project partners were made up of a consortium of researchers from across Europe and were headed by the Energy Research Centre.

The purpose of the experiment was to study the wind turbine's aerodynamic characteristics and detailed tests and measurements were carried out on the motor blade. In the wind tunnel it was possible to control the wind speed and direction. Most wind tunnels rely on small models of wind turbines which do not reflect the full scale dimensions of real turbines. Therefore this experiment was pioneering in the field of study.

These unique results produced extensive measurements of the pressure on the blades and air flow around the blades and motor. A database was then constructed detailing these measurements, which has been organised in a self-explanatory way and stored on hard drives which were distributed between the participants.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4360

Testing electronics at a low cost

Current requirements for system-on-a-chip (SoC) devices to be used in high-temperature applications pose a number of challenges before these are used in the automotive, avionics and oil extraction industries. Starting with the development of endurance and reliability test strategies, significant steps have been made towards identifying the fastest route to the market.

High-temperature electronics has emerged as a strategic technology for many key industrial sectors, such as the oil and gas extraction, automotive and avionics industries. Silicon on insulator (SOI) technology, more specifically, has added the advantages of light-weighting and fault-tolerant electronic systems, operating reliably even when exposed to temperatures as high as 200 ° C.

To ensure their structural and operational integrity, the ATHIS project sought to develop dedicated strategies, enabling to test electronic devices under similar operating conditions to those exposed in field.

The University of Newcastle upon Tyne was instrumental in providing an economical alternative to commercial 'dynamic burn-in' systems.

To reduce the tests costs substantially, it was necessary to take measures to reduce the testing time. Furthermore, to ensure a good coverage of all possible faults which can occur in integrated and miniaturised distributed electronic systems, a combination of current and voltage testing schemes was adopted.

continued on page 43

High-quality biomedical titanium castings

Dentists have found that the use of titanium (Ti) and Ti alloys is sometimes the only option for patients with allergenic problems. The Catipro project was established to overcome the challenges posed by casting, in order to produce tailor-made implants that fulfil the patient's exact needs.

A European consortium was created comprising experts in the field of ceramics, metallurgy, foundry technology and biocompatibility. Their aim was to develop a cost-efficient method for producing high-quality Ti castings for biological applications. These are mainly dental fittings, but also include other biomedical products such as trachea pipes and maxillo-implants.

The use of Ti and Ti alloys has begun to replace gold in the medical and dental fields, particularly in Japan and the United States. The application of Ti is set to increase even further as the European population ages. Moreover, oral cast titanium products are expected to be much cheaper than using gold.

Work was undertaken by Catipro involving casting preparation procedures for the application of dental porcelain. Results showed that surface roughness was significantly dependent on the grain size and applied pressure during sandblasting, although it was unaffected by the incident angle.

The surface roughness of Ti casting could be increased by a number of factors. These included increasing the average size of the alumina grains and raising the velocity of the particles by increasing the pressure of the sandblasting machine. A study was also undertaken to improve the parameters for casting and to detect the origin of defects during this period.

It was concluded that defects such as lack of filling and dimensional errors were a result of bad design for the feeding process. This was most important for machines where the filling and solidification process is by differential pressure, compared to those which used centrifugation.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4309

Application of more accurate methods to weld inspection

Time of flight diffraction (TOFD) is a highly sensitive and accurate method for the non-destructive testing (NDT) of welds for defects. The Tofdproof project adopted an integrated approach for applying TOFD to the detection and sizing of defects in carbon steel welds at the manufacturing stage.

The project had seven goals, which included the performance of TOFD inspection and procedures for the application of TOFD. Training and certification needs were also addressed, as were the design of acceptance criteria. Technological, economic and human factors were also considered. The performance of TOFD was compared and contrasted with conventional NDT techniques. These were defined by the European standards applied to the testing of pressure vessels at the manufacturing stage.

The results of each evaluation carried out on every specimen were stored in a database set up on a website. The TOFD results needed to be compared quickly and reliably with those obtained through NDT. Therefore, specific tools were developed to facilitate this process. Comparisons were normally performed through the use of probability of detection (POD) curves and tools for statistical analysis. At the same time, optimised TOFD procedures and specific related acceptance criteria were also developed.

The Tofdproof project drew up training and certification guidelines which were then distributed to the relevant organisations. These included the NDT Society, the European Committee for Standardization (CEN) and those companies within the EU which deal with weld inspection. The TOFD method was then applied on site to two welded components. This enabled the technical efficiency and financial competitiveness of TOFD compared with NDT, to be highlighted. The results were then to be disseminated among specialists in NDT.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4310

continued from page 42 **'Testing electronics at a low cost'**

The modular architecture of the high-temperature testing scheme proposed by the ATHIS project partners allows it to be easily configured. Besides generating the thermal stimuli for the integrated circuit under test, the actual responses can be stored, analysed and dynamically manipulated. An off-chip current monitor was, for this purpose, preferred because of its time-efficient response and low cost, as well as the significant flexibility provided for the test procedure.

The enhanced capabilities of the test system have already been successfully demonstrated on safety and efficiency critical systems which will be incorporated in future automotive applications.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4328

Modelling stress and strain in nuclear reactors

Research has aimed to reduce the discrepancy between theory and practice regarding the toughness of components used in nuclear reactors.

Safety remains a primary concern in the operation of nuclear reactors. Proper assessment of the risk of component failure is an integral part of safety management. Extensive research has been performed to date, but gaps in knowledge still exist.

The Vocalist project examined in detail the potential of small cracks to cause significant damage. Serco LTD and Areva ANP GmbH, a nuclear technology expert based in Germany, oversaw the relevant laboratory and modelling experiments.

Serco and Areva used special components, such as SE(B) pre-cracked Charpy V and CT specimens as well as notched bars, to investigate the effects of stress and strain in the laboratory. A mapping procedure was then applied to obtain the data necessary to calibrate the mathematical models that describe crack initiation and growth.

Serco and Areva used three models: Weibull, Beremin and Rousellier, to cover the full range of brittle and ductile behaviour. While the models did not converge in all situations, the results were, in general, encouraging with respect to model performance.

The Vocalist findings may be used to address safety concerns associated with Europe's ageing nuclear reactors as well as the next generation of reactors.

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 > 4314

Increasing the lifetime of aircraft engine parts

A new process to apply protective coatings will help keep aircraft engines in service longer and reduce scrap rates during engine overhaul.

Europe is a key player in the aerospace industry. RTD efforts sponsored by the European Commission help maintain a competitive advantage. For instance, the Growth programme funded the Ordico project to produce more robust turbine blades for aircraft engines. The research consortium includes engine manufacturers, airlines and other industry stakeholders.

Sustained exposure to high temperatures at high altitude can lead to thermomechanical fatigue of aircraft engine components. The Ordico participants sought new, less expensive ways of applying special coatings that protect against oxidation and extend the expected lifecycle.

A two-stage process was developed by Sifco Turbine Components Ltd in Ireland. First, a thin layer of platinum (Pt) is deposited on a super alloy substrate. This is then heated to temperatures above 1 000 °C to facilitate diffusion. The second stage involves the use of a high temperature aluminium (Al) coating reactor. By manipulating the coating parameters, the Irish engineers were able to achieve a homogeneous Pt/Al coating.

Tests of the new coating revealed significant improvement over conventional Pt/Al coatings. Resistance to oxidation and fatigue were 50 % and 200 to 300 % better respectively. Further to these encouraging results, Sifco Turbine Components Ltd and its partners have applied for patent protection for the Ordico coating technology.

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

http://cordis.europa.eu/marketplace > search > offers > 4364

Internal combustion engines for an overhaul

New measurement facilities have been developed within the Minnox project to improve the current understanding of the link between nitrogen oxide (NOx) formation and heat transfer process. Along with advanced simulation techniques, the significant optimisation potential of internal combustion engines can be exploited to reduce environmentally hazardous emissions.

Under the state of the art, an efficient way to achieve the drastic reductions prescribed by legislators in nitrogen oxide (NOx) emissions from internal combustion engines is to calibrate exhaust-gas aftertreatment systems. For this purpose, an engineering model for turbulent heat and mass transfer was developed to account for the all important physical effects occurring in passenger cars' and commercial vehicles' engines.

Based on detailed numerical studies of the flow and turbulence structure, the model developed within the Minnox project was still simple enough to be implemented in computational fluid dynamics codes. Importantly, the thermal imprint on the viscous layer near the wall bounding the flow was integrated for simulations of internal combustion engines as well as similar industrial applications.

Verification of the newly developed model was achieved for idealised flow configurations through the comparison of numerically estimated predictions with benchmark

continued on page 45

High-temperature rub in rig for compressor casings

European companies have been especially active in the search for more efficient gas turbine engines. This has included improving the abradable seal between the turbine blade and its casing, leading to significant improvements in engine efficiency and fuel consumption.

The SEAL-COAT project has resulted in a much better and more fundamental understanding of abradability. An abradable coating means that if it rubs against a more abrasive material in motion, the former will be worn whereas the latter will not. The material is used in coatings in the compressor and turbine sections of aircraft engines. Here, minimal clearance is required between the blade tips and casing, while taking into account thermal expansion. A large enough clearance must be used to prevent the tip from catastrophically contacting the casing. Therefore, abradable coatings must not only allow for closer clearances, but also to automatically adjust clearances, in situ, while the device is operating.

Before newly developed coatings such as abradables can be applied to engines they must first be thoroughly tested. The SEAL-COAT project originally designed a device for testing new abradables under conditions that were as realistic as possible. The test temperature of the device, known as a rub in rig, was limited to 650 °C. Because engine performance can be improved by increasing the pressure ratio, compressors experience higher temperatures. Therefore, higher test temperatures of up to 750 °C were required for the test rig.

The SEAL-COAT team modified the existing rub in rig with a new heating system and with a new unit for controlling the heating system. Through this upgrade they were able to test abradables for future applications, both for themselves and on behalf of customers who require their unique services. This work is applicable not only to the aero-engine market but also to gas turbines for power generation, pump compressors and engine turbochargers.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 4368

Chromium and carbon nanodispersion coating

German engineers united chromium with carbon in a special nanostructure to produce a novel coating optimised for low wear and friction applications.

Vehicles are a significant contributor to emissions of particulate matter, not only from their exhaust pipes but also from engine and tyre wear. Europe is tightening its emissions' standards and auto manufacturers will require new technology to comply.

Participants in the Nanocoat project, funded in part by the Growth programme, investigated the potential of new coatings to improve engine component performance characteristics. The Fraunhofer Institute for Material and Beam Technology in Germany, experts in tribological applications, led the development of a chromium and carbon nanodispersion (Cr+C-ND) coating.

They combined physical vapour deposition (PVD) with vacuum-arc discharge to deposit extremely thin layers of the coating. Laboratory tests indicated increased hardness, crack resistance and oxidation resistance in comparison to a typical carbon film. The lower friction coefficient of the Cr+C-ND coating is also an advantage for tribological applications, particularly in dry or mixed lubrication conditions.

The Cr+C-ND coating can easily be applied to metal substrates with complex geometry such engine components. Faster rates of deposition are also possible with the use of pulsed arc technology. Further to the positive Nanocoat results, the Fraunhofer Institute for Material and Beam Technology had sought patent protection for the new coating.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 4372

continued from page 44 **'Internal combustion engines for an overhaul'**

experimental data provided by project partners from the King's College London. These experimental investigations were undertaken with the aim to improve the current understanding of pulsating flows and provide accurate design guidelines for more efficient heat exchangers.

The effects of driving frequencies and amplitudes of imposed flow pulsations, as well as those of Reynolds number on measured quantities were investigated by means of a dedicated experimental facility. Periodic velocity perturbations could be introduced to the fluid flow within a closed-circuit flow visualisation facility through a rotating valve driven by an electric motor of variable speed.

Designed and realised to specifically enable measurements of heat transfer and unsteady fluid flows, it is nevertheless envisaged that it will provide reliable experimental data for the refinement of turbulence modelling. Investigations on the potential use of flow pulsations as a means of heat transfer enhancement, leading to significant energy savings, could be further extended to cover other engineering applications.

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 > 4082

The following upcoming events were selected from the event diary of the Directorate-General for Research and from the CORDIS event calendar. For further information on past and upcoming events, please visit:

http://ec.europa.eu/research/events
http://cordis.europa.eu/events

International conference on data mining

The IEEE 'International conference on data mining' (ICDM 2008) will be held in Pisa, Italy, from 15 to 19 December 2008.

The conference covers all aspects of data mining, including software and systems, algorithms and applications. In addition, ICDM attracts researchers and application developers from a wide range of data mining-related areas, such as statistics, machine learning, pattern recognition, databases and data warehousing.

By promoting novel, high-quality research findings and innovative solutions to challenging data mining problems, the conference seeks to continuously advance data mining. Besides the technical programme, the conference will feature workshops, tutorials, panels and the ICDM data mining contest.

For further information, please visit:
http://icdm08.isti.cnr.it

Winter school on climate

The Marie Curie Research Training Network 'Network for ice sheet and climate evolution' (NICE) is organising a winter school on 'Integrated modelling of the past climate and the future climate: the role of the cryosphere' from 4 to 11 January 2009 in Aussois, France.

The aim is to show not only the great diversity of climatic models through their components (atmosphere, ocean, sea ice, vegetation, ice sheet, marine biosphere), but also the very large variation in the complexity of these models (conceptual models up to three-dimensional global climate models).

Giving a wider audience an opportunity to improve their understanding of the numerical simulation tools of the global climate, the school is open to all interested young scientists, PhD students and post-docs.

For further information, please visit:
http://nice.ipsl.jussieu.fr/meetings/nice_2009_01

Winter school on multilevel modelling in political science

The EU-funded 'Integrated and united? A quest for citizenship in an ever closer Europe' (Intune) project is organising a winter school on 'Multilevel modelling in political science' from 11 to 14 January 2009, in Barcelona, Spain.

The school would like to offer a practical introduction to issues related to multilevel modelling, an increasingly used family of statistical techniques whose application can be quite diverse and complex. At the same time, the school aims to motivate young researchers to work together in an interdisciplinary environment, with a view to both the theoretical and empirical dimensions of the work in these fields.

The winter school is intended for PhD students and young scholars interested in multilevel modelling. The school will be limited to 30 participants: 20 participants from the Intune consortium and 10 participants who are not involved in the project.

For further information, please visit:
http://www.intune.it/events/winter-school-in-barcelona

Conference on computer science

'Software seminar' (Sofsem) is an annual international conference devoted to the theory and practice of computer science. Its next edition will take place in Špindlerův Mlýn, Czech Republic, from 24 to 30 January 2009.

The conference programme consists of a number of invited talks given by prominent researchers, contributed talks selected from submitted papers and the 'Student research forum'.

Sofsem is organised in parallel tracks, giving an opportunity to quickly obtain an overview of the areas that are selected as the topics of the year. These will include:
- foundations of computer science;
- theory and practice of software services;
- game theoretic aspects of e-commerce;
- techniques and tools for formal verification.

For further information, please visit:
http://www.sofsem.cz

Ageing eye conference

The 'Ageing eye conference' will take place at the Kunstmuseum Bonn, Germany, from 20 to 21 March 2009.

Age predisposes to diseases affecting virtually all parts of our body. This is especially true for the eye where the two major eye diseases, age-related macular degeneration and glaucoma, account for two thirds of all cases of blindness in Europe. The conference will provide the European and the global perspective on the major causes of blindness, state-of-the-art research of the pathogenesis of the major age-related eye diseases and their socio-economic impact. The current options for treatment and rehabilitation will be discussed and future treatment strategies will be envisaged.

The conference will address these questions and bring together key scientists from basic and applied research that will contribute to foster a multidisciplinary discussion, to promote our understanding and to stimulate further research into ageing eye diseases.

For further information, please visit:
http://www.eurovisionnet.eu/news/news-ageing-eye-meeting.html

Congress on energy efficiency and renewable energy sources

The '5th international congress and exhibition for south-east Europe on energy efficiency & renewable energy sources' will take place in Sofia, Bulgaria, from 6 to 8 April 2009.

Its goal is to encourage investment in energy efficiency and the introduction of renewable energy in the region. The forum is an excellent platform for dialogue and business contacts. It uniquely combines scientific and industrial issues from all perspectives of energy efficiency and renewable energy sources, providing industry professionals with the latest technologies, strategies and best practices to lower costs and improve reliability.

For further information, please visit:
http://www.viaexpo.com/congress-ee-vei/eng/congress.php

Conference on research networking

'Research connection 2009', a conference and exhibition dedicated to research networking, will take place on 7 and 8 May 2009 in Prague, Czech Republic.

The EU budget for research and innovation is increasing every year and this conference aims to highlight the ways in which participants can get involved. First-hand information about priorities, objectives and participation rules will be available and useful practical advice will be given at special sessions. Particular attention will be paid to promising ideas from the newest EU Member States.

The event will present three major ongoing research initiatives:
- the Seventh Framework Programme (FP7), 2007-13;
- the Structural Funds, 2007-13;
- the Competitiveness and Innovation Programme (CIP), 2007-13.

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

Conference and call for papers on sustainable development

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

The scientific committee of the conference, chaired by Professor Carlo Jaeger from the Potsdam Institute for Climate Impact Research and the European Climate Forum, is pleased to invite submissions of papers for this conference. The deadline for submissions is 15 January 2009.

Coming close to mid-term of the Seventh Framework Programme (FP7) implementation, this 3-day conference will take stock of the progress made so far and identify ways and means for putting the European research system at the service of sustainable development.

With this in mind, the conference will initiate a structured dialogue on how to reform European research to best respond to sustainable development challenges. It will also investigate ways for improving the link between science and policy and the relationship between science and society.

For further information, please visit:
http://ec.europa.eu/research/sd/conference_en.html

Conference on surgery

From 28 to 30 May 2009, the New European Surgical Academy (NESA) will organise in Athens, Greece, the yearly 'NESA days', an international, interdisciplinary conference aiming to promote the exchange of knowledge and stimulate new thinking on surgery.

NESA was founded in 2004. Among its members are leading surgeons, hospitals, professional associations and international organisations in 40 countries. NESA deals with the re-evaluation and optimisation of surgical procedures as well as with the international transfer of surgical know-how in cooperation with international organisations. The five disciplines represented in NESA are: general surgery, obstetrics and gynaecology, urology, otolaryngology, and anaesthesiology.

For further information, please visit:
http://www.nesa-days.com

International conference on nutraceuticals and functional foods

'Food and function 2009', an international scientific conference on nutraceuticals and functional foods, will take place in Zilina, Slovak Republic, from 9 to 11 June 2009.

The conference will focus on the current advances in the research of nutraceuticals and functional foods and their present and future role in maintaining health and preventing disease. Its goal is to provide a scientific forum for all stakeholders of nutraceuticals and functional foods and enable the interactive exchange of state-of-the-art knowledge. The conference will focus on the evidence-based benefits of nutraceuticals and functional foods.

For further information, please visit:
http://www.foodandfunction.com

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