



# research<sup>eu</sup>

## RESULTS SUPPLEMENT

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**Promoting environmental research**

Researchers are faced with many environmental challenges today. Global warming, water availability and decreasing fossil fuel reserves are all issues topping the list of priorities facing mankind in the foreseeable future. This publication seeks to illustrate the many ways EU-funded projects can help improve ecological sustainability and reduce the footprint of human economic activity on the environment.



The lead section on biology and medicine begins with a project which is looking for ways to ensure that chicken are toxin-free. Researchers from the 'Poultry-check' project have analysed four drugs used against Coccidiosis, a severe condition found in intensively reared poultry, to develop a user-friendly and automated immunoassay system.

With the world increasingly looking at alternatives to fossil fuel, solar energy is bound to be one of the future solutions. The opener for the energy section is dedicated to PVSAT-2, a project through which a remote satellite-based performance check of photovoltaic systems was set up.

It is generally recognised that olive mill wastewater is an environmentally troublesome by-product of the olive oil industry. To dispose of it without any treatment causes serious environmental damage, especially in the Mediterranean area. The opening article in the environment section highlights the research carried out in order to solve this issue. The Newtechomw project has developed new low-cost technologies to decrease olive mill wastewater toxicity.

The focus in the IT and telecommunications lead article is placed on the increasing interaction between different areas of research. The 'DNA based nanowires' project studied the feasibility of packing very large amounts of information into DNA.

The industrial technologies section opens up with an article illustrating the ongoing progress achieved in the field of design simulation. The EMF project has developed a simulation process that enables engineers to realistically predict the projected performance of automobile parts, thereby reducing the need for physical testing.

The recently introduced events section offers readers a selection of upcoming event announcements in the field of research.

Your comments on the *research\*eu* publications are always welcome. Please send questions or suggestions to: [research-eu-supplements@publications.europa.eu](mailto:research-eu-supplements@publications.europa.eu)

We wish all our readers a blissful and successful new year, and look forward to continuing our regular coverage of innovative EU-funded research in 2009.

The editorial team

**Erratum**

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

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

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## EVENTS

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## Antibodies for toxin-free chicken

*The presence of harmful chemicals in food is of great concern to both consumer and producer. European researchers have developed a sensitive antibody-based assay for common coccidiostat drugs used in the poultry industry.*

Coccidiosis is a serious condition common in intensively reared poultry. This range of diseases is caused by a single-celled parasite that lives in the gut wall of the host. Symptoms vary but lethargy, muscle wastage and diarrhoea are common effects and death can occur. The infective agent can remain viable for at least a year and worryingly, this stage is resistant to most disinfectants.

Consequently, producers faced with control of this disease apply coccidiostat drugs as part of the feeding regime. Unfortunately, some of these drugs are suspected to be carcinogenic and can be present as residues in the meat. European legislation has set strict limits for the levels of xenobiotics in poultry products. In line with this, the EU-funded project 'Poultry-check' set about to refine an accurate assay for four coccidiostat drugs — halofuginone, nicarbazin, toltrazuril and the nitroimidazole group.

Some of these molecules have low molecular weight and are therefore not capable of eliciting a reliable immune response. Large proteins such as albumen were selected to bind onto them to avoid this source of error. After extensive *in vitro* trials to identify humoral- or fluid-induced immune responses, the polyclonal antibodies were collected and characterised. For each of the coccidiostats under study, a dose-response curve was produced. Furthermore, cross-reactive or multispecific antibodies were identified using a range of compounds structurally related to the coccidiostats.

Information relating to this work has been disseminated widely through workshops, scientific articles and general information in the form of posters at chemical safety conferences. Informa-

tion on 'Poultry-check' can be obtained from the website at <http://research.utu.fi/residues>

In terms of the quest for safer meat products, the success of the product arising from this research is undeniable. A simple, user-friendly and automated immunoassay system has been developed using highly specific polyclonal antibodies. This will benefit not only the interests of the poultry industry but ultimately the consumer.

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

Collaboration sought: licence agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4373



## Improved detection of drug residues in chicken

*The poultry industry has come under attack for the presence of xenobiotics in its products. Researchers in the EU-funded project 'Poultry-check' have refined a technique to detect coccidiostat residues from food additives used in poultry rearing.*

The practice of using medicated feed is commonplace in a bid to control and treat infection in poultry. For example, coccidiostats control intestinal damage caused by chicken parasites. Residues of these drugs however are harmful within the food chain and their control is of paramount importance.

In order to improve safety and reliability of poultry, researchers worked on the tests for residues of certain coccidiostats in chicken liver and eggs. These included nicarbazin, toltrazuril and nitroimidazoles. Partners in the 'Poultry-check' consortium refined assays to overcome some of the problems in residue

detection. Their aim was to develop a method whose sensitivity was below or equalled the EU-recommended limits of the additives.

Accordingly, the team refined and improved the liquid chromatography-mass spectrometry (LC-MS) technique. This is an analytical separation technique that combines the selectivity of chromatography with the sensitivity of MS detection. It can therefore be used for the identification of drugs at trace levels.

One of the drawbacks of the analysis method is the use of hazardous solvents. Extraction

methods were changed to limit this undesirable factor and to speed up the process. The LC-MS procedure can detect both positive and negative ions. Another refinement was based on the eradication of the phenomenon of ionisation suppression, which frequently occurs as a matrix effect during the assay.

The analysis methods were all developed according to the criteria laid down in EC directives and regulations. The refinement of testing for drug residues in poultry products will likely allay consumer resistance and doubt about the safety of the consumption of chicken and eggs.

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 > 4353

### Frequent acronyms

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

## Glucosinolate and resistance to insects in plants

*Some plants employ organic compounds called glucosinolates to deter the insects and other pests that attempt to feed on them. Scientists from the Natural project used the plant *Arabidopsis* to study the genetics of glucosinolate biosynthesis.*

Glucosinolates occur as secondary metabolites in the Brassicales/Capparales plant family. They comprise a heavily modified sugar molecule, sulphur and nitrogen. Although secondary metabolites are not directly involved in the normal growth, development and reproduction of the plants, they are of ecological importance. This is because glucosinolates act as natural pesticides and as a defence against

herbivores, giving the plants a sharp bitter taste.

The Natural project investigated how naturally occurring traits in plants vary according to their environment. The project studied the genetics of glucosinolate biosynthesis and variation in different forms of the model organism, *Arabidopsis*. One important quantitative trait locus (QTL) was precisely

identified. This stretch of DNA controlled glucosinolate levels and resistance to herbivorous insects.

Statistical methods for molecular population genetics were used to identify genes that could help manipulate the production of glucosinolates in crop plants. This could be achieved through either transgenic methods or through marker-assisted breeding.

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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## Self-healing wheat

*Ensuring food safety is very much dependant on developing a set of risk-reduction methodologies applicable at every step of the food production process, from farm to fork.*

The EU-funded Fucomyr project concentrated on the development of a new 'protective' approach: for wheat that could resist infection from the fusarium fungi. This pathogenic fungal species can produce mycotoxins, which pose serious health risks to the consumers. Project partners therefore sought to employ bioengineering techniques to develop new breeds of wheat, armed with the necessary genetic and protein tools to fight off infection.

Isolating the candidate genes that could be used for the purposes of inducing resistance formed a substantial part of the Fucomyr project. The BBSRC John Innes Centre studied the genetic differences of wheat breeds that are naturally fusarium-resistant

and those that are susceptible. Researchers created a double haploid population of two such breeds, totalling 114 lines and examined the level of resistance in each.

The studies resulted in a series of genetic markers associated with resistance loci. The identification of these markers should reduce the overall processing time of breeding programmes aimed at isolating fusarium resistant breeds.

These new breeds could result in a new generation of agricultural products, reducing pesticide use while ensuring the health and safety of the consumer.



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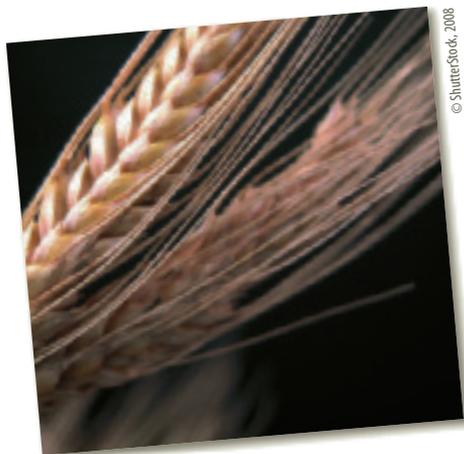
Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 3929

## Wheat plants with inbuilt anti-infection protection

*Preventing, rather than treating, fusarium infections in European wheat farms is an approach that is clearly advantageous. Biotechnology is now making this approach possible.*



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The EU-funded Fucomyr project aimed to improve the overall health of wheat cultivars in Europe by preventing fusarium infection and mycotoxin production. The partners set out to determine the methodologies necessary to isolate those wheat populations naturally resistant to fusarium fungal infection.

Austrian partners, IFA-Tulln isolated wheat plants that displayed resistance to the deoxynivalenol (DON) mycotoxin. DON is produced by fusarium pathogenic fungi and can have a serious impact on health. Scientists estab-

lished that resistance to DON is a pretty solid indicator of overall resistance to fusarium infection.

The collected data were grouped in a database available for scientists conducting further research in this area. Investigations into how DON resistance genes can lead to a decrease in overall virulence could indeed lead to a series of new wheat cultivars in Europe. Rather than treating infection or using artificial means through which to control it, modern science is now offering methods to boost the plant's genotype. These methods allow plants to achieve resistance and long-term health without further input.

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 > 4143

## Sensitive ultrasound to spot early-stage cancer

*European researchers have developed highly-sensitive ultrasound equipment that can detect tiny quantities of reflective microbubbles engineered to stick to specific tumour cells. The technique should pick up tumours early and improve patients' chances of survival.*

Most of the current diagnostic methods—biopsy analysis, biochemical tests and medical imaging—are not sufficiently sensitive. They frequently return a false negative; the tumour is only discovered when it is much bigger, and too late.

European researchers are developing a new technique that will help medical professionals visualise tiny quantities of pathological tissue in patients. The technology could localise tumours in their very earliest stages of development and help doctors begin treatments much earlier, giving patients a much better chance of survival.

The new approach uses medical ultrasound, a safe technology most commonly used for prenatal visualisation of the foetus and the imaging of other soft tissues. A probe sends high-frequency acoustic waves into the body and detects how they bounce off the interfaces between different tissues.

To improve the sensitivity of this imaging technique, a sonographer may sometimes inject a so-called contrast agent into patients, which greatly increases the scattering of the acoustic waves back to the probe. For ultrasound imaging, contrast agents are based on 'microbubbles', micron-sized gas-filled balls that show up brightly on the ultrasound image.

Researchers in the EU-funded Tamirut project have developed a microbubble

medium that can specifically target and bind to certain pathogenic cells in the body (such as endothelial cells of vessels lining the tumours). Combined with enhanced ultrasound equipment and signal processing capabilities, the system can detect where microbubbles adhere to target cells, and reveal the presence of early-stage tumours.

Working with the pharmaceutical company Bracco Research S.A. in Switzerland, Tamirut researchers have developed a way to attach antibodies onto the surface of microbubbles. By selecting an antibody with an affinity for marker molecules found only on target vascular cells, the microbubbles 'stick' only to the target cells.

But it is not easy to pick up these hotspots on a scan. 'We are looking at the very earliest stages of tumour growth, so there are not many cells present expressing the marker of interest,' explains Alessandro Nencioni who coordinated the project.

'There may be only three or four microbubbles adhered to a site and current ultrasound equipment is not able to pick these up. Work on the hardware and signal processing is an essential aspect of this project as we seek to develop next-generation ultrasound imaging capabilities.'

Esaote, an Italian manufacturer of medical imaging equipment, is working with several research partners and two SMEs: Vermon, a French manufacturer of medical imaging probes, and SignalGeneriX, a small firm based in Cyprus with expertise in signal processing. Their aim is to produce a scanner and a dedicated probe that can transmit and receive ultrasound waves across a wide range of frequencies and wave forms in order to exploit (without any modification) the harmonic components caused by non-linear scattering of the acoustic wave of the microbubbles.

The scanning equipment must have sufficient processing power to interpret the waves picked up by the probe, update the live image and adjust the transmitted waveforms in real time. Their detecting function is ensured by a specifically developed signal processing methods, able to detect a very limited number of microbubbles (down to a single bubble), to estimate their concentration, and

to track their behaviour to get the diagnostic answer searched.

Originally, the project partners thought it would be possible to differentiate between bound and unbound microbubbles by the way they scatter particular ultrasound frequencies and wave forms. However, extensive simulations and laboratory testing have shown that this turns out to be very difficult. Instead, the scientists found a very simple answer: after 10 minutes, the microbubbles that are attached to target cells remain in place while the free microbubbles diffuse away.

The new probe will detect and calculate their local concentration and operators will be able to visualise any areas of high microbubble density within an entire organ. The repetition of this new imaging technique over time could help medical staff to assess the evolution of a tumour, especially its vascularisation.

Using the engineered, targeted microbubble contrast agent, the improved ultrasound hardware and the signal processing, the Tamirut team has already demonstrated in simulations the potential of this approach for the early detection of prostate cancer.

'Our approach goes a long way to eliminating or strongly reducing the problem of false-negative diagnosis,' says Nencioni, 'offering a second degree of evaluation after blood test screening. It is sensitive, specific and you are able to examine the whole organ, which is not possible by biopsy.'

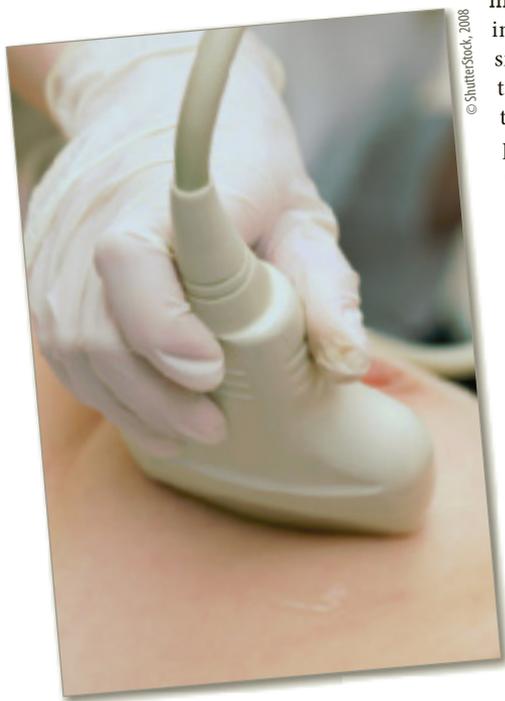
This ultrasound method improves accuracy, patient comfort and costs around half that of a biopsy. It could save European health care providers up to EUR 250 million each year in biopsy costs alone.

The need for clinical trials of the targeted contrast agent and subsequent approval in humans means that the targeted microbubble agent is unlikely to be available for at least three years. But the improved signal processing algorithms will help to increase the sensitivity of ultrasound equipment, irrespective of the use of these microbubbles.

Esaote is working with the other commercial partners to incorporate the new signal processing features into its medical imaging equipment by the end of 2009.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90119>



## Enabling the blind to find their way

*'Eyes on the future' is the mantra of the 'World Sight Day' held this month to raise awareness of blindness and vision impairment. New technologies, developed by European researchers offering the visually impaired greater independence, live up to this vision.*

Many of the most innovative systems have been created by a consortium of companies and research institutes working in the EU-funded Enabled project.

The project has led to 17 prototype devices and software platforms being developed to help the visually impaired, two of which have been patented.

Guide dogs, canes, Braille and screen readers that turn digital text into spoken audio all help to improve the lives of the blind or severely visually impaired, but none of these tools can make up for having a friend or relative accompany a blind person around and assist them in their daily life. However, a human helper is not always available.

'Blind people often have to rely on others to do things that we do naturally... and that restricts their independence,' explains Wai Yu, the project coordinator and a researcher at the Virtual Engineering Centre at Queen's University in Belfast.

Activities that the sighted take for granted, such as going for a walk in the park or trying out a new restaurant, becomes an odyssey for the visually impaired, particularly when they do not already know the route by heart.

A guide dog can help them avoid dangers in the street, be it a curb or a lamppost, but it cannot show them a new route. People can be asked for directions, but following them is another matter entirely when you cannot read street signs or see landmarks.

Those barriers have typically prevented the visually impaired from exploring the world

around them on their own, but now, with the new technologies, they can surmount some of these barriers.

'Our goal was to give blind people more independence by helping to bridge the information gap with the sighted,' Yu says.

To achieve that, the project partners worked in two broad areas. On the one hand, they developed software applications with tactile, haptic and audio feedback devices to help visually impaired people feel and hear digital maps of where they want to go. On the other hand, they created new haptic and tactile devices to guide them when they are out in the street.

One of the patented prototypes, called VITAL, allows users to access a tactile map of an area. Using a device akin to a computer mouse they can move a cursor around the map and small pins will create shapes under the palm of their hand.

The device could produce the sensation of a square block to define a building, or form into different icons to depict different shops and services — an 'H' for a hospital, for example.

'Braille readers and audio readers let blind people read or hear text from computers and the internet, but until now there has been no easy or practical way to portray graphical information,' Yu says. 'We chose to work with maps because they are particularly useful for visually impaired people.'

Having obtained a 'mental image' of the map from the computer, users can then take the route information with them when they venture outside. For that purpose,

the project partners used a commercially available navigation aid called the Trekker, which uses GPS to guide users as they walk around, much like a navigation system in a car.

However, the Trekker gives only spoken directions, something that can be disconcerting for blind people, who may not want to draw attention to themselves. The device can often be hard to hear in noisy, city environments.

The Enabled team therefore developed prototypes to provide directions through tactile and haptic feedback, rather than via audio alone.

One patented device developed by the project team, the Viflex, looks similar to a TV remote control with a movable plate at the front. The user rests his thumb on the plate, which tilts in eight directions to guide users based on the directions given by the Trekker.

'It is more discreet and natural than following audio commands,' Yu says.

The aim of the Enabled team's research is not to replace tried and tested aids for the blind, such as canes and guide dogs, but to complement them with new technologies that can improve the independence and autonomy of the visually impaired.

For the visually impaired worldwide, such technologies should start to become a reality over the coming years as the applications developed by the Enabled team make their way into commercial products.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tp/article/id/90170>

## New anticancer innovations

*In spite of their desired anticancer activity, metalloproteinase inhibitors are plagued by a series of severe side-effects, limiting their commercial development.*

The EU-funded 'Profiling MMP inhibition' project focused on identifying metalloproteinase functionalities and subsequently favourable antineoplastic profiles. This is expected to form the next step towards designing new metalloproteinase inhibitor compounds without unwanted side-effects.

Partners worked on a series of innovative approaches in this field of anticancer

research. Researchers combined a modified-anthrax-toxin containing pro-drug (PrAg-U2) with FP59, a recombinant cytotoxin. The combination was tested out on mice with a variety of neoplasias. Antitumour effects were shown to be promising however the combination displays a dose-response relationship with regard to both antitumour efficacy and systemic toxicity.

Toxic side-effects appear to be problematic in spite of efforts to alleviate them. Administration of murine monoclonal antibodies could serve towards systemic protection against toxicity. However, further research into this field is warranted in order to arrive at an efficacious anticancer compound.

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

<http://cordis.europa.eu/marketplace/search/offers/4442>

## The quest for a histamine-free glass of wine

*Histamine is an unwanted product of the fermentation process in food and wine. Project partners of Decarboxylate have researched the genetics behind histamine production in a broad range of lactic acid bacteria (LAB).*

LAB produce energy from the decarboxylation pathway. Decarboxylation is also a way for the bacterium to reduce its acid stress



levels by turning amino acids into amines. Unfortunately, the biogenic amines produced by these biochemical pathways, beneficial to the bacterium, can be harmful when inadvertently taken in with food and drink.

Researchers based at the university of Bordeaux, a wine producing region, investigated the complex genetics behind decarboxylation. They found four open reading frames (ORFs) in a strain of *Lactobacillus hilgardii*, a bacterium they isolated from wine. These were situated on the plasmid, the circular piece of DNA apart from the main chromosome. They code for proteins including the enzyme decarboxylase itself and an enzyme acting as an exchanger for histamine and its precursor histidine.

The team then looked at other LABs for similar gene sequences. Fermentation is a common metabolic activity. They sequenced genes from a wide range of bacteria. These were isolated from wine, cheese, sauerkraut, horse digestive tract and squid liver sauce. Similar sequences were found in all

the species. However in the case of horse digestive tract and cheese, the genes were on the main chromosome itself.

Location of the gene sequences has serious implications for the bacterium and the food producer. Genes on the circular plasmid are transferred to other bacteria during conjugation when bacteria pass on genetic information and may be lost. Genetic location is therefore important from the point of view of genetic stability and inheritance of the pathway genes.

The scientists further investigated *L. buchneri* from the cheese. Closer analysis of one of the genes named *hdcC* revealed it coded for a membrane protein responsible for histidine/histamine exchange. This was probably a first time discovery for the gene in that particular bacterium.

Research of this nature could well lead to the identification of improved strains of LAB. The aim is to produce strains that do not have the genetic capability to produce biogenic amines. The consumer could then enjoy a histamine-free glass of wine.

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 > 4181

## Preserving the fine bouquet of wine

*The taste and aroma in wine and cheese is a matter of complex biochemistry. Scientists from the EU-funded project Decarboxylate have researched the genetic cause of a very undesirable chemical in wine, putrescine.*

In the process of fermentation, there is a very fine line between the production of a chemical giving a pleasant bouquet and one that indicates the wine has 'gone off'. Decarboxylation for example can result in one or the other depending on the starter molecule. With the dairy- and wine-making industries in mind, the Decarboxylate project researched the production of these unwanted chemicals.

Putrescine is just one of the many noxious chemicals that can be produced in fermented foods. It is a biogenic amine (BA) that belongs to the same group as histamine, renowned for its toxic properties. As the name suggests, putrescine smells of rotting meat, not exactly what is required as an accompaniment to a meal.

Putrescine can be produced by lactic acid bacteria (LAB) in two pathways. The first, that is well documented, is through the enzyme decarboxylase. The second more recently discovered pathway involves the

polyamine agmatine. Agmatine is converted into putrescine with two enzymes, agmatine deiminase (AgDI) and a putrescine transcarbamylase (PTC).

Project partners at Bordeaux University isolated potential putrescine genes in a range of LAB. The next step was to clone, purify and then sequence them. One of these was found to be AgDI and the other, a transporter, researched by the University of Groningen, was acting as a catalyst in the pathway. Also, gene clusters for putrescine production involving PTC were found but there were variations between bacteria species in terms of enzymes produced and the gene order.

For the wine-making industry, it is essential that bacteria can

be screened for particular gene sequences. In-depth knowledge of these pathways could well mean that producers can pick and choose the strains they use to avoid the production of unwanted amines.

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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## Cattle breeding potential mapped

*In terms of genetic tools, a map of the genome can form a solid basis for further research and breeding. In response to this, European researchers have compiled two bovine radiation hybrid maps using independent methodologies.*

The overall aim of the European project Bovgen was to produce a map of the bovine genome which could then be compared or merged with previous bovine maps. A combination of polymerase chain reaction (PCR) primers and expressed sequence tags (ESTs) from an earlier EU-funded project and other collaborating laboratories were used to achieve this goal.

A radiation mapping technique was used where distances between sequences are proportional to radiation-induced breaks which are in turn related to their actual distances. One advantage of this methodology is that markers do not have to be polymorphic as in the more conventional maps.

There are 29 pairs of autosomes and the usual X and Y sex chromosomes in the bovine genome and radiation hybrid (RH) maps were created for the full set. Two

independent maps were produced. First, using the ESTs, the total length of the whole genome was calculated together with marker distances and compared with the MARC 2004 linkage map.

To create another distinct map using the ESTs, micro-satellite and amplified fragment length polymorphism markers were put through the Illumina bead station system producing over 5 000 typed markers. The markers were mapped using two point linkage analysis on already established RH vector sets.

The maps produced can be used for further comparing and honing maps produced



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by other genetic techniques. For the cattle industry, this could mean a better understanding of the genetics behind traits with commercial value.

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 > 4403

## Construction of a bacterial artificial chromosome map of the bovine genome

*Scientists have constructed a bacterial artificial chromosome (BAC) map, which has become a valuable resource for the bovine genomics research community.*

The Bovgen project created advanced genomic tools that allowed researchers to identify the genes responsible for important traits in cattle. A set of 20 000 non-redundant complementary DNA (cDNA) fragments were sequenced and used to construct a high-density gene map for the bovine genome. This helped to identify the position of candidate genes for mapped traits. The information regarding genetic sequence and radiation hybrid maps was used to construct a physical BAC map of the entire cat-

tle genome. This in turn was used for targeted DNA sequencing.

Bacterial chromosomes were used as hosts for pieces of bovine chromosome. These hosts generated many identical copies of a piece, or clone, of bovine DNA. The BAC map was the collection of overlapping clones, which represented the entire genome. BAC contiguous overlapping clones (or contigs) that had end sequence or genetic markers embedded helped to identify the positioning and orientation of sequences.

The map not only helps to identify useful traits, it will also greatly help future efforts to sequence the entire genome for cattle.

The BAC map and sequence information can be used to more accurately select genetically superior cattle for specific needs. These may include leaner beef, higher milk yields, reduced feed requirements, and improved health. The data from the Bovgen project was made available to the 'International bovine genome sequencing project' to assist in the assembly of the sequences.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4441

## Genetic studies beef up the meat industry

*Scientists from an EU-funded project Gemqual have identified genes and markers that are responsible for good-quality beef.*

For the consumer, processor and producer, meat quality involves many criteria. Weight, yield, taste, appearance, cooking and nutritional qualities represent just a few of the general categories concerned. Obvious nutritional properties are amino and fatty acids, vitamins and minerals. Moreover, the list of nutrients is constantly being extended and modified on the basis of current research into their physiological roles.

Scientists from the Universidad Computense de Madrid, under the umbrella of the Gemqual project, identified genes coding for qualities such as fatty acid content, juiciness and carcass parameters. The team then searched for markers for these candidate genes.

The study was based on an analysis of 440 bulls belonging to 15 European breeds that all had a similar diet. A total of 108 traits were measured. Modelling and

statistical techniques were designed to eliminate error and unwanted associations. One such example was the transmission disequilibrium test (TDT). This was applied on the basis that it only detects genetic linkage in the presence of genetic association without the influence of population structure.

In total, 12 genes were discovered associated with fatty acid content. One is an omega-3 fatty acid, eicosapentaenoic acid (EPA). This fatty acid is thought to be associated with fighting atherosclerosis, lowering inflammation and even combating some depres-

continued on page 11

## Improving crop nutritional quality

*New methods have been discovered to improve the nutritional value of crops for the diet of non-ruminant animals.*

The nutritional value of a crop as a food, feed or raw material is largely determined by the essential amino acids it contains. Essential amino acids are those which cannot be synthesised by the organism and therefore must be supplied in the diet.

The OPTI-2 project has made advances in improving the composition of amino acids in European maize and potato crops since the obtained results are easily transferred to other crops. Essentially, European academic and commercial research labs created a cooperative consortium for new tools and strategies with safety aspects and consumer acceptance being of paramount importance.

In the course of their effort, it was found that certain proteinogenic (protein building) amino acids, namely cysteine and methionine reveal many essential direct or indirect functions in cellular metabolism. Methionine is an essential amino acid which non-ruminant animals need in their diet but which is quite low in cereal crops and legumes. Therefore the goal was to improve the nutritional quality of crops by either

expressing or down-regulating target genes in the entire plant.

Two genes of special interest were expressed in phloem companion cells or in whole plants using a promoter that drove the catabolism towards production of cysteine and methionine. The data collected shed light on the complex pathways for production of the amino acids. For example, provision of a precursor for the carbon backbone of the amino acid is only successful when threonine synthase (TS), which shares the same substrate for methionine manufacture, is down-regulated.

The team at the Max Planck Institute for Molecular Plant Physiology found that expression of the homoserine kinase gene (HSK) from cytosolic sources gave improved results. Overall, it gave much higher levels of the aspartate family including methionine than that obtained from plasmids.

Implications were that there should be further research involving cell-type expression using a promoter that is strongly active in a wide range of cells. Advancement on this



piece of research holds the promise of being able to satisfy the full dietary requirements of animals through basic fodder crops like cereals and legumes.

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 > 4438

## Boosting amino acid production in food crops

*Scientists with Vrije Universiteit Brussel in Belgium investigated the possibility of enhancing amino acid production in food crops.*

Amino acids are essential for humans and animals alike and therefore significant value could be gained by boosting the amino acid content of foodstuffs such as maize. Several of Europe's leading plant research organisations set out to do just that in the context of a project called OPTI-2.

Experiments were performed on *Arabidopsis thaliana*, a plant whose properties are conducive for genetics studies. Production of the amino acids lysine, threonine and methionine share the precursor

aspartate semialdehyde (ASA). Thus, one of the focuses of the OPTI-2 research was to improve our knowledge of these biochemical pathways in the hopes of learning how to influence the outcome.

Plant geneticists with Vrije Universiteit Brussel isolated a number of genes involved in ASA synthesis. Next, *Arabidopsis thaliana* knockouts were produced in which each of these genes were disabled. Amino acid production was then quantified and compared against wild varieties of the same plant.

The results indicated that it is possible to increase threonine production, specifically with the variant in which the *Arabidopsis* dihydrodipicolinate synthase (DHDPS2) gene is knocked out. Attempts to make additional lysine and methionine were not successful during the scope of the research. The Belgian scientists did, however, discover how to impair dihydrodipicolinate synthase (DHDPS) activity and thus promote overproduction of threonine.

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 > 4422

continued from page 10 'Genetic studies beef up the meat industry'

sive illnesses. Other genes characterised were four coding for live measures such as fattening and nine for qualities like texture and weight loss during cooking. A further five genes coded for carcass measurements.

Traditional selection methods involve not only genetic effect but the results of production systems. Using genetic information, selection of bulls could be made on

the grounds of molecular information alone. Further research in this domain is required however as other research has indicated different data from other populations.

Many of the genes isolated by this research are important on an economic basis. Bad press caused by bovine spongiform encephalopathy (BSE) and increased consumer preference for healthy meat means a sound basis for high-

quality meat animals will be very valuable. The data from this study promises to provide a solid basis for improving the competitiveness of the European beef industry.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4409

## Cargo delivery for gene therapy success

*Gene therapy is a promising option for the treatment of many inherited and viral diseases. Researchers from the EU-funded project CPP have investigated a novel means of delivering genetic material into the cell where it can become functional.*

Gene therapy is the means whereby genetic material is inserted into cells or tissues where it can be used to treat a disease. This can take the form of replacement, inactivation or introduction of a completely new gene or genes. One of the main stumbling blocks however has been how to actually deliver the appropriate genetic agent where it can be effective.

In order to find an alternative to viral transfecting agents for delivery of the so-called cargo, the CPP project investigated the use of cell penetrating peptides (CPPs). The team based at the Laboratory of Molecular Biology in Cambridge specifically focused on using conjugated CPPs to facilitate cargo uptake and passage to the desired destination in the cell.



The scientists developed methods to link CPPs chemically to a range of antisense oligonucleotides, peptide nucleic acid (PNA) and short interference RNA (siRNA). All these cargo molecules have the potential to modulate gene activity. For example, antisense oligonucleotides modify gene action through a steric blocking mode of action.

Observations showed that release into the cytosol or nuclear areas of the cell,

was difficult to achieve. Delivery to these sites was shown to be structure dependent. However, the team found that this could be facilitated by use of chloroquine, the anti-malarial agent which acts as an endosomal release agent. Action was also induced when CPPs were linked to siRNA. In this case, reduction of expression of the p38 MAP kinase was observed, a pathway implicated in many inflammatory conditions.

Once in the cell, the conjugates were found primarily in membrane bound structures, usually endosomes. An ingenious method of testing used a Tat HIV-1 system where activity is only achieved when steric block cargo enters the nucleus and binds to its RNA target.

The protocols developed as part of this research could constitute a valuable part of splicing of genetic sequences and consequent gene correction. The findings of this research form a solid basis on which anti-viral and anti-cancer therapies could be based.

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

Collaboration sought: financial support.

<http://cordis.europa.eu/marketplace> > search > offers > 4439

## Patient-friendly test for cystic fibrosis within spitting distance

*European researchers, as part of the Europroof project, have developed the foundations for a non-invasive test for cystic fibrosis (CF) based on the glycoprotein content of saliva.*

CF is one of the most common potentially lethal genetic conditions in Europe. Symptoms include thick mucous production from submucosal glands in the lungs, intestines, pancreas and liver. This causes gross system disruption and ultimately potential multi-system failure. Genetically, the disease is the result of a mutation in a single gene, the cystic fibrosis transmembrane conductance regulator (CFTR).

One of the inherent problems encountered in treatment of CF involves lack of definitive diagnosis so that effective timely therapy can be applied. For example, growth problems due to lack of digestive enzyme production in young children can be avoided. Given prompt identification, a high calorie and vitamin diet and a supply of the enzymes taken orally can be prescribed.

There are many tests for CF and normally more than one test will be run to confirm the disease. Sweat tests on the basis of salt content can be carried out but false positives are not unknown. The alternatives include genetic testing looking

for variation in the CFTR gene, enzyme and fat content in stools, lung function, and an immunoreactive trypsinogen test.

Accordingly, the EU-funded project Europroof aimed to identify proteins specifically transcribed in CF individuals. This would then increase understanding of the disease and improve diagnosis and therapy. Danish project partners based at the University of Copenhagen, during their research into the disease, unexpectedly found a possible basis for a simple patient-friendly test.

During screening using lectin column chromatography and electrophoretic separation, they found elevated levels of saliva glycoproteins in CF sufferers. This was further confirmed in later investigations during the course of the project. Moreover, the increases were shown to be distinct and significant. On the basis of these findings, further investigations were planned to specifically identify the characteristics of the new glycoproteins, the exact biochemical alterations and quantitative changes.

For sufferers of cystic fibrosis and carriers of the disease, further refinement of a simple chemical test as a diagnostic tool would be a very welcome development. Moreover, the test would be economic and could help in the quest to provide better, more prompt care for CF patients.

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 > 4450



## Plasmid vaccines in the fight against allergies

*Allergen-based DNA vaccines promise to be an effective therapy against the unprecedented increase in allergy-related diseases. Researchers from the EU-funded project Allnavac have developed a plasmid DNA vaccine and evaluated its potential mode of action.*

The incidence of allergic diseases such as asthma and chronic rhinosinusitis has seen a large increase in the past three decades. In line with this is a demand for preventive therapy measures in the form of allergen-based DNA vaccines. Project partners used common allergens from the dust mite and *Parietaria officinalis* pollen to construct plasmid-based vaccines.

The consortium of scientists under the umbrella of Allnavac completed research to develop and evaluate vaccines that modulate allergic responses. Specifically, project

partners at DRFZ in Germany have developed a DNA vaccine that delivers the antigen directly into the major histocompatibility complex (MHC) Class II. This region encodes for proteins that modulate antigen loading onto the MHC proteins themselves in the lysosomal compartment. This was achieved by the binding of the antigen ovalbumin with an invariant chain peptide which shows promiscuous binding to a great variety of MHC class II allotypes.

Two features of the system prevent the activation of the humoral immune system

which is based on antibody production. First, the plasmid DNA induced strong T cell differentiation without an antibody response. Second, the antigen is retained in the transfected cells and may therefore be a safer option.

Overall, this plasmid-based DNA vaccine may offer a means by which Th2 T helper cell action may be harnessed without triggering allergic reactions. Furthermore, it may be able to target desired T cell responses to tackle autoimmune reactions.

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 > 4421

## Technologies for the detection of allergens

*Allergy-inducing foods can prove detrimental to consumer health on certain occasions and certainly impact quality of life. Developing less allergenic foods will prove beneficial to European consumers, health providers as well as the food industry.*

The EU-funded Redall project dealt with foods that cause allergies and sought to develop technologies in order to aid their detection. The overall aim is to use the scientific finds of the project to identify food allergens and develop less allergenic foods.

Researchers used molecular biology technologies to try and identify trace amounts

of specific biological material from chicken and bovine origins in food stuffs. These materials could act as allergens and therefore technologies for their detection form a key aspect of research. Polymerase chain reaction (PCR) is essentially based on the *in vitro* amplification of DNA segments even at extremely low starting concentrations, to the point of accurate detection.

Partners established the suitability of different technologies for the detection of potential allergenic material in a variety of food samples. PCR methods were deemed best suited for the detection of trace amounts of beef and chicken. On the other hand, the enzyme-linked immunosorbent assay (ELISA) method should be used for the detection of milk and egg containing products.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4423

## Wood dust inflammation in lungs

*The EU-funded project 'Wood-risk' has shed light on the inflammatory action of wood dust during in vitro and in vivo trials.*

Exposure to any agent causing inflammation gives rise to a cascade of biochemical and cellular changes. This is characterised by a whole array of cells and proteins that rush to the site of exposure in response to

the harmful stimulus. White cells include macrophages, lymphocytes, neutrophils and eosinophils. The protein line-up associated with inflammation includes cytokines and chemokines.



Project partners at the Finnish Institute of Occupational Health looked for these indicators of inflammation in a mouse model *in vivo* and *in vitro*. Trials monitored responses to both hard and soft wood dust. In particular, they compared the responses to two types of wood commonly used in the furniture industry — birch and oak.

*In vitro* studies involved observations of a mouse cell line for changes that indicated an immune response. In this case,

they found that birch was a stronger inducer of the proteins cytokines and chemokines. Analysis of *in vivo* studies showed that both oak and birch induced the whole battery of cells associated with an inflammatory response. However, quantitative and qualitative measurements suggested that there was a differential response for different woods. This time, oak dust was implicated as a stronger promoter of proteins indicating inflammation.

Overall the study indicated that repeated exposure to wood dust could influence the development of allergic asthma through the modulation of white blood cell proteins. The differential response to different types of soft and hard wood will no doubt be instrumental in setting limits for some 3.6 million workers involved in the wood products industry in Europe.

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 > 4448

## Natural light can purify drinking water

*While water disinfection with chlorine is under attack because of potential health and ecological concerns, an environmentally-friendly way of cleansing drinking water may be on the horizon. Solar-assisted water disinfection takes advantage of the ultraviolet component of natural sunlight to inactivate water-borne bacteria.*

Among all the current environmental problems, those related to water are probably the hardest to solve as they will probably have the worst consequences in the long term. Problems associated with water scarcity, gradual destruction and contamination of fresh water resources are becoming more pressing in many areas of the planet, including the semi-arid areas of the Mediterranean basin.

The possibility of using solar energy to disinfect contaminated drinking water was explored within the Aquacat project as a promising economical solution to a difficult environmental problem. More specifically, the use of singlet oxygen and photosensitisers for the production of this highly reactive agent captured the attention of project partners at the Universidad Complutense de Madrid.

By immobilising photosensitisers in a polymer matrix, they generated oxygen in its singlet excited state requiring only sunlight of appropriate wavelength. There were several advantages to the use of immobilised photosensitisers in water purification, for example the ability to recover and reuse photosensitisers. Moreover, a marked improvement in the stability of the produced silicon- (Si) and ruthenium- (Ru) based photosensitisers allowed numerous repetitions of photo-oxidation without degradation of the sensitiser.

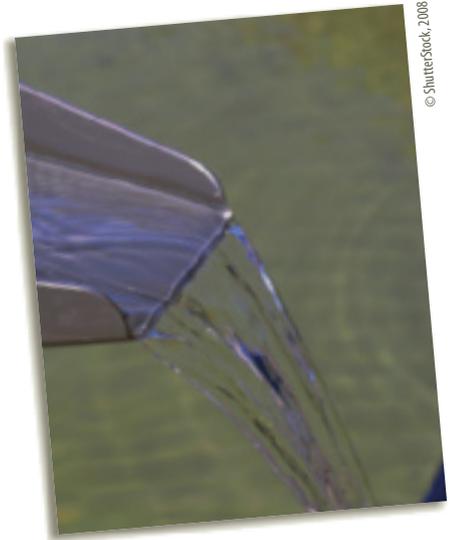
Since the main objective of water disinfection is to inactivate pathogenic microorganisms living in the water, ultraviolet along with visible wavelengths were selected. These are the most destructive for microbial life. The polymer-supported photosensitiser was used in the Aquacat pilot solar photo-reactors in north Africa where solar energy

is abundant and water-related problems frequent. The effectiveness of photosensitised singlet oxygen to inactivated *Escherichia coli* (*E. coli*) was proven under different experimental as well as real conditions.

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

Collaboration sought: further research or development support.

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## Depuration of contaminated mussels

*Research undertaken in the context of the Talisman project led to the discovery of a feeding regime that can accelerate the recovery of mussels contaminated with diarrhetic shellfish poisoning toxin.*

Europeans are fond of shellfish, but recent scares with food poisoning have shaken consumer confidence. In response, the shellfish industry is collaborating with leading marine scientists to improve the safety of their product.

North Bay Shellfish Ltd coordinated a group of nine organisations hailing from the United Kingdom and Norway during Talisman. One of the research objectives was to learn how to manipulate feeding regimes to

remove toxins from contaminated shellfish in a process known as depuration.

Diarrhetic shellfish poisoning (DSP) affects mussels and can cause gastrointestinal discomfort in consumers unlucky enough to ingest tainted mussels. Successive experiments with DSP-infected mussels led the Talisman team to an effective feeding regime. The result for the shellfish industry is that they can revive their product and bring it to market two to three weeks earlier than before.

North Bay Shellfish Ltd and its partners also investigated ways to minimise the economic burden associated with mussel depuration. Further to their analysis, their recommendation is to centralise depuration operations onshore. This will also facilitate standardisation and quality assurance control.

The Talisman consortium is proceeding with the dissemination of these findings to stakeholders in the shellfish industry.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4433

## Mucosal DNA vaccination in infected sheep

*Mucosal DNA vaccinations were administered to sheep. The immune responses in blood were recorded before and after challenge to ascertain the effectiveness of mucosal immunisation.*

Mucosal immunisation is the administration of a vaccine that enters the body through the mucosal membrane, which lines the body's passages and cavities. These include the gastrointestinal, respiratory and urogenital tracts as well as the inner and middle ear and the eyes. Therefore, any vaccine taken orally will take the gastrointestinal mucosal route of immunisation, for example.

Researchers from the MVAC project evaluated mucosal DNA vaccination in sheep infected with the maedi-visna virus (MVV), which causes encephalitis and chronic pneumonitis. The team found that antibody responses were elevated after plasmid immunisation. There was no evidence that the commercially-available vaccine modified vaccinia Ankara (MVA) boosted the antibody response.

Most animals developed detectable antibodies in their blood serum after being challenged with MVV. However, there was not a significant difference in antibody concentrations between immunised and control groups. Immunisation with gag resulted in an increase in interferon gamma (IFN $\gamma$ ) production by T cells, compared to controls, seven weeks after DNA immunisation. T cell cytotoxic responses were extremely limited before and after mucosal immunisation.

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 > 4440

## Satellite-based performance check of photovoltaic system

*A low-cost hardware user interface was used to communicate between photovoltaic (PV) systems and the PVSAT-2 server. It relayed data concerning the amount of energy being produced and gave notification of any possibility of failure.*

The PVSAT-2 project has enabled a remote performance check of PV systems to be made cheaply, based on internet communication structures. This allows the system's reliability and efficiency to be significantly increased. The procedure employs irradiation data from a satellite to simulate the energy yield of a PV system.

A low-cost hardware device was added and integrated into the PV system. It provides automated measurements and two-way communication to a central client-server decision-making system. The device records energy production, transferring the information to the central server once a day. It is also able to detect system failures and their possible causes. The fully automatic procedure means that the measurements are extremely reliable because human error such as incorrect meter readings have been avoided. The PVSAT application is also easy to use.

There are also benefits for the development of the communication infrastructure. This includes PVSAT-2 contributing to the integration of PV systems into future energy distribution structures by increasing energy efficiency. It can deliver solar resource data to the server, with the two-way communication being used



for new applications in grid management. This makes the operational management of PV solar energy systems much easier.

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

Collaboration sought: licence agreement; marketing agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4460

## An innovative photovoltaic concentration concept

*Aiming to make photovoltaic (PV) energy production more competitive, the most delicate parts of concentration in PV systems have been enclosed in a protective box.*

In recent years it has become clear that environmental pollution caused by releases into the atmosphere of greenhouse gases has no regard for frontiers. Furthermore, the phenomena of ozone depletion and atmospheric warming have begun to undermine public confidence in the ability of current efforts to control and remedy their effects.

With the protection of the environment and security of energy supply being the main driving forces, the contribution of renewable energy sources to electricity production is steadily increasing. The aim of the CAC project was to make solar electricity affordable by developing PV systems that will cost only EUR 3 per Watts peak (Wp). Reaching this goal will lead to a much wider use of solar electricity throughout Europe in the near future.

Research work under the coordination of the Spanish company Solúcar Energía S.A. led to the development of a cylindrical-parabolic reflector, concentrating sunlight over PV cells. The most innovative component of

this concentrating PV system is that sensitive elements such as PV cells and reflectors are enclosed in a sealed box that protects them from atmospheric corrosion.

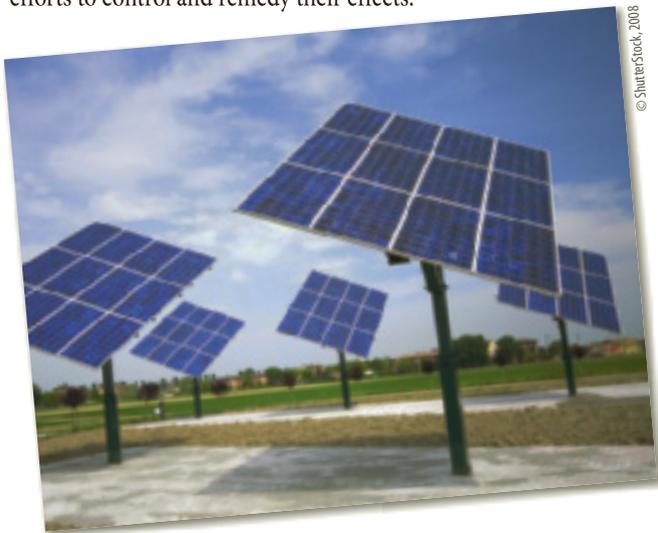
More specifically, the inner atmosphere of the protective box, made of low absorption glass, was treated to minimise aggressive gases responsible for the fast degradation of standard monocrystalline silicon cells. Furthermore, a passive heat sink element was incorporated to evacuate remaining heat to the outside. As reflectors' silvered or aluminised layers are highly susceptible to humidity penetration, the protective box is provided with an active humidity regulatory element.

Creation and maintenance of a controlled atmosphere within the concentration system had never before been applied in PV systems. Moreover, the new concentrator technology leaves the door open for future integration of more efficient PV cells, helping to reduce manufacturing costs. The ultimate challenge for the system's developers would be to prepare the technology for market penetration.

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 > 4446



## Providing high-resolution solar irradiance data

*Advances in irradiance modelling achieved during the Heliosat-3 project will benefit the renewable energy sector.*

The Heliosat-3 project sought to exploit data from sensors aboard Meteosat second generation satellites. The research was led by physicists with the University of Oldenburg in Germany. One of the key deliverables of Heliosat-3 was a new operational irradiance scheme.

The scheme provides horizontal global and diffuse irradiance data with high spectral, temporal and spatial resolution. At its heart is a new SOLIS clear sky scheme that employs radiative transfer theory to calculate global and direct clear sky irradiance. The required input includes climatological values for aerosol, water vapour and ozone concentrations in the atmosphere or quasi real-time data if available.

A significant challenge the modellers faced was accounting for the impact of clouds on the amount of irradiation received at the surface. The Heliosat-3 approach involved the incorporation of new algorithms for shading, cloud reflectivity and ground reflectivity. In addition, output from the SOLIS clear-sky scheme

is used to drive an all-weather module that addresses the spectral effects arising from clouds.

Evaluation of the new modelling tools during the project revealed a substantial improvement in accuracy with much smaller mean bias errors. The University of Oldenburg and its Heliosat-3 partners also



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## A future fuel for the transport sector

*Currently, transportation is almost entirely dependent on crude oil-derived fuels, gasoline and diesel. As the interest has shifted to biofuels offering security of supply, the Afforhd project sought to demonstrate the feasibility of dimethyl ether (DME) as a transport fuel.*

In many ways DME seems to be a promising future fuel for transport purposes. Produced from a wide range of feedstocks, such as natural gas, biomass, agricultural and urban waste, DME has excellent combustion properties. Emissions of carbon dioxide (CO<sub>2</sub>) and particulate matter from a diesel engine running on bio-based DME

are extremely low, while high energy-efficiency can be maintained.

The EU project Afforhd, supported by the Fifth Framework Programme (FP5), has taken DME technology to a level high enough to allow demonstration and commercial development. Research focused on



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developing DME-tolerant fuel systems, addressing durability problems arising, in part, from the lack of lubricity — a quality on which conventional diesel fuel systems rely. DME also has very low viscosity, leading to problems such as internal leakage in supply pumps and fuel injectors.

Project partners at the Technical University of Denmark concentrated their efforts on investigating the influence that fuel viscosity and lubricity may have on physical processes leading to wear. From laboratory tests based on the high-frequency reciprocating rig (HFRR) test method, more accurate estimates of the boundary lubrication ability of low sulphur DME fuel were derived. Complementary computer simulations visualising molecular dynamics calculations revealed the role of molecular length in the observed wear during lubricity tests.

Low-viscosity DME fuels composed mainly of molecules of 6-16 carbon atoms, significantly less than diesel fuels, would need to have higher lubricity to attain an acceptable lifetime for the injection pumps. The new insights offered into boundary lubrication mechanisms that involve longer alkanes can guide future developments in this challenging technical area of DME vehicle applications.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4398

## Making offshore wind farms more reliable

*A new system developed with European expertise analyses signals from wind turbine components to expose problems before they can cause turbine failure.*

It is anticipated that wind power will become increasingly important in Europe's energy portfolio. Offshore wind farms have overcome obstacles related to aesthetics and public acceptance, but are more likely to break down than their land-based counterparts.

The Conmow project sought to increase the reliability of offshore installations. In the context of the project, Gram & Juhl, a Danish engineering firm with considerable experience in wind turbine applications, developed a turbine condition monitoring (TCM) system.

The system entails installing sensors at several locations on the turbine to provide feedback on various components. The sensor data is analysed by a software applica-

tion in order to provide early fault detection, thereby allowing time for intervention. The TCM system was developed to interface seamlessly with the turbine's existing supervisory control and data acquisition (SCADA) system.

An initial experiment in the Netherlands was unfortunately rendered ineffective due to constraints regarding sensor placement. This issue was resolved and subsequent tests with other turbines were able to provide more valuable data. Gram & Juhl believe the TCM system has the potential to automate the monitoring of multiple



offshore wind turbines and significantly decrease non-operational time.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4482

## Finding hydrocarbon reserves with cyclopropane

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

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

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

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

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

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

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

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4304

## Innovative fuel injection system for dimethyl ether

*The Netherlands Organisation for Applied Scientific Research (TNO) has engineered a new fuel delivery system for dimethyl ether (DME) to help put cleaner vehicles on the road.*

Alternative fuels can help Europe reduce its emissions of greenhouse gases as well as noxious air pollutants. DME is a promising alternative fuel that can be produced from natural gas, or better yet from renew-

able biomass. There are, however, technical obstacles which must be overcome before DME can be considered a viable option.

The Afforhd project brought together vehicle manufacturers, research institutes and powertrain specialists to produce a DME-powered demonstration vehicle for the heavy-duty market. The TNO, an Afforhd partner, contributed by developing a new fuel feed pump.

DME is not self-lubricating and is therefore not compatible with conventional fuel injection components such as gaskets and o-rings. The solution was a design that relies on hydraulics instead of sliding parts. TNO

also succeeded in eliminating electronic components from the DME feed pump.

The pump, which has a capacity of 2.2 l of fuel per minute, was subsequently incorporated into a heavy-duty vehicle. Five tanks supply DME to the truck's engine at high pressure (15 bars). Tests confirmed the feasibility of the technology, consequently the Afforhd consortium is moving forward with the DME vehicle.

It should be mentioned that the new fuel feed pump can also be used with other gaseous fuels, such as liquid petroleum gas (LPG).

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4418



## Towards a cleaner diesel engine

*An engineering model has been developed within the Minnox project to account for all important physical effects occurring in an internal combustion engine. Based on detailed numerical studies of the fuel mixture's complex flow, it is simple enough however to be implemented in different stages of diesel engine design.*

Diesel engines offer the possibility of combining very high thermal efficiencies with fuel efficiency, which results in low carbon emissions. Their only drawbacks are emissions of nitrogen oxides (NO<sub>x</sub>) and particulates, which trade against each other in many aspects of the engine's design. For example, very high temperatures in the combustion chamber can help reduce the emission of soot, but produce higher levels of nitrogen oxides.

The Minnox project aimed to identify the most efficient way to achieve the drastic cuts in NO<sub>x</sub> emissions from diesel engines prescribed in the short and medium term by the legislators. Modelling tools have proven to be valuable towards reducing the experimental work needed for accurately predicting fuel mixture formation and subsequent performance of internal combustion engines.

Research conducted at the laboratories of Ford-Werke AG in Germany focused on

improving the computational fluid dynamics (CFD) modelling of wall friction and heat transfer within the engine's cylinder. For this purpose, the circulation of coolant to remove heat from engine components and avoid reaching high temperatures that would be detrimental to lubricating oil were also taken into consideration.

Verification of the improved heat transfer model was pursued for idealised flow configurations through comparison with experimental and large eddy simulation (LES) data. To calculate the gas and water flow, computational grids were generated based on computer-aided design (CAD) models of the combustion

chamber components and cooling water jacket around the engine's cylinder.

When used to calculate the metal temperatures of a modern, state-of-the-art gasoline engine, the accuracy of the new model coupling CFD with finite element (FE) methods was clearly demonstrated.

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 > 4427



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## Distributed intelligence

*The electricity system inherited from the 20<sup>th</sup> century has been reliable, but centrally coordinated. Advanced information and communication technologies (ICT) can effectively introduce intelligence into the electric power network.*

ICT will be indispensable in managing the electric power networks of the future, in which distributed energy resources (DERs) will play a central role. ICT already offer the advanced capabilities required for monitoring today's complex networks at an affordable cost.

The ultimate aim of the CRISP project was to derive all the benefits from available ICT opportunities for promoting the sustainable development and growth of electric power grids. To integrate DERs as well as renewable energy resources (RERs) efficiently, new grid architectures will be required. To this end, intelligent control over network operations will need to be extended to the distribution level and beyond.

Project partner IDEA G.I.E. in France proposed a grid architecture oriented towards more flexible and importantly, distributed network op-

erations. Sub-networks could be managed by a software agent, the 'Smart grid automation device' (SGAD) that enables decentralised real-time control of the electric power network.

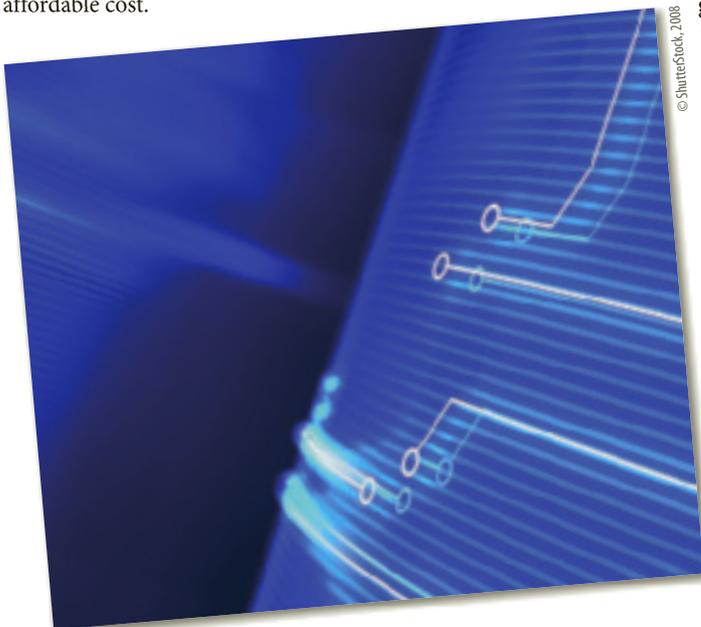
The SGAD can download from the regional control room part of the network's electrical map that corresponds to the so-called local 'grid cell' and update it when changes to its configuration are required. Local information, for example about the future electric power production and consumption could also be sent by the SGAD upwards to a higher level control centre.

There, all this information could be progressively aggregated and processed, whereby the production and consumption balance of the electric power network as a whole is checked and rational decisions are taken. If electric power reserves are able to respond in real time, the stability and robustness of electric power networks could be strongly reinforced by the contribution of DERs and RERs.

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

Collaboration sought: information exchange/training.

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## Effect of olive mill wastewater on soil properties

*The Newtechomw project developed new low-cost technologies for reducing the phenol content of olive mill wastewater (OMW). This was achieved through the use of natural catalysts including components found in soil.*

Newtechomw carried out an investigation into the effect of OMW on the chemical and biochemical properties of soil. Changes in enzyme activity within soil samples treated with two different OMW/soil ratios were measured over different time periods. The toxic effects of treated and untreated soil on plant growth were also studied by carrying out germination tests.

The results showed that several activating or inhibitory affects occurred simultaneously. Chemical transformation of phenols in the OMW was catalysed by iron and manganese present in the soil, reducing the toxic effects on plant growth. When the two different OMW/soil ratios were examined, no significant differences were found in their chemical and physical properties. However, the results for biochemical properties showed that enzyme activity varied considerably over time between those soil samples treated with OMW and those left untreated.

Tests were carried out on the properties of soil following treatment with OMW before and after samples were detoxified to reduce their phenol content. The results showed that there was less activity for most enzymes analysed in soils treated with detoxified OMW, which had lower phenol content. This is compared to those samples of soil which contained untreated OMW.

The germination tests indicated that the soil environment was less favourable to plants growing

in the medium with the highest OMW/soil ratio. In contrast there was only a 20 % reduction in germination when the lower OMW/soil ratio was used. In addition, the use of OMW where phenols have been removed was less detrimental to the properties of soil than using untreated OMW.

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 > 4212



## Turning wastewater into fertiliser

*Research funded by the EU has demonstrated the potential for reusing waste products from the olive oil industry as an effective fertiliser.*

Olive oil is one of the agricultural mainstays of countries bordering the Mediterranean Sea. Unfortunately, the cultivation of olives and the subsequent production of olive oil have been associated with extensive environmental degradation across the region.

Partners from both sides of the Mediterranean teamed up during the Newtechomw project to investigate ways to reduce the environmental impact of olive oil mills. One clever idea they came up with involves the reuse of olive oil mill wastewater (OMW) as a fertiliser.

Biologists with the University Cadi Ayyad in Morocco were faced with the challenge of overcoming initial laboratory findings indicating that OMW was toxic to some plant species. They applied OMW to plots of several species, including date palm, maize, atriplex and wheat, using a technique called fertirrigation. Compared with control plots, the fertirrigated plots expe-

rienced stronger growth without showing any negative side effects.

Possible impacts on soil health were also studied. Measurements of electrical conductivity indicated a rise in soil salinity. However, many beneficial soil parameters were enhanced, including organic matter content as well as levels of the three main soil nutrients: nitrogen, phosphorus and potassium. In addition, the soil pH was relatively unaffected thanks to the neutralising capacity of the native calcareous soil.

Thus, rather than causing environmental damage or necessitating expensive wastewater treatment facilities, OMW could be successfully recycled back into the farming industry. The Newtechomw consortium is following up on these positive results.

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 > 4172



## Environmental effects of public vehicle fleets

*The public transport fleet in the English town of Winchester was upgraded to reduce air pollution emissions. This was achieved through the auspices of the Miracles project, which included local authorities and transport companies amongst its partners.*

The quality of the environment in cities depends to a large extent on appropriate traffic management. The town of Winchester in southern England was chosen to take part in the Miracles project due to the increasing challenges from congestion and air pollution. The city has a very long history and an ancient street pattern still exists in many areas, which cannot cope with today's heavy traffic.

As a result, Winchester was declared an Air Quality Management Area in 2003, when air pollution from traffic exceeded the acceptable level set by the government. The local authority devised various initiatives to improve air quality, which were initiated with the aid of key partners. The

intention was to reduce the environmental impacts of the Hampshire County Council (HCC) and public transport fleets. This was achieved through the use of cleaner fuels and technology.

The HCC and public transport fleets were renewed with low and zero emission vehicles, including liquid petroleum gas (LPG) and Euro 3. Euro 3 are vehicles that comply with requirements drawn up by the EU for controlling the emission of pollutants. A number of buses that complied with Euro 2 were fitted with continuous regenerative traps (CRTs) which remove the particulates emitted by diesel engines. A campaign was also carried out to raise public awareness of the benefits of environmentally-friendly

vehicles. This involved demonstrations of buses using alternative fuels and diesel/electric hybrid buses.

The Miracles project showed that the upgrading of buses to the higher Euro standards was a cost and energy efficient way of reducing emissions. Although fuel costs increased slightly, maintenance costs were reduced by 60 % for the new Euro 3 buses. For upgraded Euro 3 buses (from Euro 1 standard) in the transport fleet, fuel consumption remained the same.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4435

## Bacteria wage war on cultural preservation

*The increasing threat to Europe's cultural heritage can be seen in many cases, including the damage environmental pollution does to architectural monuments and statues. In the case of architecture, restoration and preservation techniques are expensive and time consuming, and sometimes, generate pollutants themselves. A new EU-funded programme examines the use of bacteria to combat pollution decay as an alternative method.*

Biobrush is a six-member consortium of European specialists designed to assess different approaches that would be the most beneficial for the restoration and preservation of stonework architecture in Europe. The feasibility study tested both in laboratory and then later in the field, examined risk and performance values specifically under differing climatic conditions.

Conducted both in northern and southern European countries, part of the study

assessed the performance of specific bacteria to wage war against pollutants. On a microbial level particular performance values were assessed. For example, hydrocarbon breakdown and sulphate reduction were examined. Moreover, the screening also examined bacteria that could be used to reduce nitrates.

Because calcite is a major constituent of limestone and many of the grand historical architectures that dot the European

landscape are built from limestone, a major focus of the project was to examine bacteria that could benefit limestone restoration. Of these *Pseudomonas putida*, a saprotrophic soil bacterium was deemed highly appropriate. It proved to assist the limestone recovery, had low risk factors to human health and high sensitivity to most antibiotics.

Other bacteria were also evaluated, the results of which have been compiled into the Biobrush culture collection. This constitutes a database of information listing the findings of the project for further use and expansion to assist R & D.

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 > 4183

## Use of electric vehicles in Rotterdam

*A large number of electrical vehicles (EVs) were purchased by the city of Rotterdam. This was part of a wider activity to encourage environmentally-friendly transport in European cities by gaining support and acceptance for the use of EVs.*

The Rotterdam municipality introduced in its fleet 50 hybrid EVs. The chosen EV was the Renault Kangoo, which also featured a very small internal combustion engine and generator, called the range extender. The range extender enabled the Kangoo's batteries to be recharged in case the on-board energy supply could not get the vehicle to its destination. The presence of the range extender therefore reduced driver anxiety about running out of battery power.

The Tellus project aimed to stimulate the use of hybrid EVs and to help them become more widely accepted. The price of the vehicle represented an obstacle to potential customers. Therefore, one of the project's main aims was to help direct consumers in the right way through large-scale demonstrations. Following the vehicles' purchase, advice and training were given to their prospective drivers and events held to highlight their use in the municipal fleet.

The city of Rotterdam considered increasing the municipal fleet by a further 50 vehicles as part of a national programme. This highly innovative undertaking proved that a large fleet of hybrid electric cars is feasible. However, the vehicles' procurement and introduction must be supported by proper training and an awareness raising campaign for employees and the wider public.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4331

## Global carbon cycle and climate change

*Researchers reconstructed the oceanic carbonate chemistry from the last glacial maximum (LGM) in order to better understand the global carbon cycle from that time. This will give scientists and policy-makers a clearer picture of the current climate and possible potential changes in the future.*



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The LGM refers to the time of maximum extent of the ice sheets during the last glaciation, approximately 20 000 years ago. The 6C project developed new tools to reconstruct the environmental parameters from that period. They also combined analytical records of the sedimentary archive with numerical models. This allowed the research team to identify the mechanisms which controlled the operation of the oceanic carbon cycle. It also enabled them to identify water masses as sinks or sources of atmospheric carbon dioxide (CO<sub>2</sub>). This gave greater insight into the role and impact of the carbon cycle on changes in climate. Knowledge of the nature and extent of past fluctuations allowed scientists to assess the stability of the modern climate and to predict any future variation.

The project's second objective was the study of sediments from the northern Arabian

Sea. The aim was to demonstrate that the level of CO<sub>2</sub> loss from this area increased significantly around 18 000 years ago. This in turn may have been a factor in the rise in atmospheric CO<sub>2</sub> levels at the beginning of the last glaciation.

Scientists believe that the oceans were instrumental in regulating glacial-interglacial changes in atmospheric CO<sub>2</sub>. However, uncertainty exists over past changes regarding the location and level of oceanic sources and sinks of CO<sub>2</sub>. The reconstruction undertaken by the 6C project indicated that the northern Arabian Sea has been a source of CO<sub>2</sub> to the atmosphere for the last 30 000 years.

The data provided by 6C allows policy-makers to achieve a clearer understanding of the natural climate system when deciding

on agreements to limit greenhouse gases. It has contributed towards more realistic scenarios concerning the impact of climate change. These are necessary for developing mitigation efforts in the EU, underlining the need to reduce future CO<sub>2</sub> emissions.

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

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

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## Reconstructing the climate of the Holocene

*Research on the impact that climate variability of the North Atlantic Ocean has on climate change in Europe does not go far enough. It covers only the past one or two centuries at best. This study addressed this knowledge gap by providing a continual record from which glacier chronologies can be evaluated.*

The Pacliva project tested patterns of climate variability at the decadal to century scale. Models which test and validate climate behaviour over time form the basis of climate prediction. This study identified the degree to which the oceanic anomaly patterns associated with the North Atlantic oscillation reflect the long-term variability of North Atlantic climates.

The scientists focused on precipitation reconstructions, because winter precipitation is a good indicator of past atmospheric variations. They based the study on the region of Scandinavia and analysed records of climate variation at Norwegian glaciers.

The scientists calculated indices for a continuous time series of non-stationarity over the last

6 000 years. They found evidence indicating that the atmosphere varied spatially and that circulation patterns varied on millennial time scales.

The study also involved sediment samples collected from catchments of the St Sorlin glacier at Lac Blanc in the south-eastern French Alps. The data compiled showed evidence of a climatic optimum, when little or no clastic glacier flour was deposited in the lake.

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 > 4417

## Studying ecological change using genetic diversity

*The MED-CORE project selected Talitrus saltator (T. saltator), a type of sandhopper, for use in monitoring ecological changes on beaches in the Mediterranean.*

Genetic variation in *T. saltator* was studied both over time and in different sites. These are small crustaceans which live in the supralittoral zone of sandy beaches. This is the area above the spring high-tide mark, which is splashed by the sea, but not submerged under the waves. Wide genetic variation was identified among populations of *T. saltator* sampled from different sites. Those samples taken along the beach at Uccellina, Tuscany, also showed wide genetic variation.

At some sites, *T. saltator* could not be found. This was most likely as a result of coastal erosion affecting the viability of the local subpopulation of sandhoppers, which can also reduce genetic variability. A reduction in the population size of a species and loss of genetic diversity can run the risk of local extinction. Other factors, such as man-made pressures on the ecosystem, can have a similar impact on genetic variation in a population. It should be noted, that some

samples of *T. saltator* were collected from beaches that were extremely popular with tourists.

In general, data collected for this particular part of the MED-CORE project agreed with earlier laboratory based results for *T. saltator*. Both new data and past results indicate that a stable sand dune belt and absence of human activity on a beach contribute to maintaining genetic variability in sandhopper populations.

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 > 4187

## Promoting rural tourism

*In Europe tourism in some rural areas seems to be lagging behind. In an effort to pump some life into the stagnant promotion activities in these regions, researchers set to work by compiling an in-depth study of the problem.*

In Europe, tourism significantly contributes to the economic and social development of regions. In some rural areas tourism seems to be making slow progress, unable to take advantage and prosper from favourable conditions. It is this discrepancy that the Sprite project sought out to address.

A study of these regions was compiled in order to make recommendations that would encourage integrated tourism, which is more sustainable and respects the natural equilibrium. Using surveys, detailed questionnaires and statistical comparisons an analysis was

made. The results outlined the perceptions, motivations and behaviour of the communities and institutions in each area.

Rural areas in six EU Member States were analysed comparatively. It was revealed that tourists are mainly domestic in origin. Businesses were found to be young, small and family-owned.

Out of the 12 study regions the natural landscape and associated activities seemed to be the main pull factor for tourists. The only exception seemed to be for Basse-

Normandie, where it was the cultural and historical factors which were the main driving factors. The good-nature and friendliness of the people played a very important role in attracting visitors in all the regions.

The researchers stressed that in the study they found the main hindrance to development was that there did not appear to be a concerted promotion strategy for tourism in these areas. This was developed by the researchers by giving institutions and local actors the opportunity to put forward ideas on how to best promote tourism.

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 > 4410

## Integrating tourism links

*A framework has been established in order to analyse integrated tourism's links, impacts and benefits.*

Sustainable tourism is essentially a way to maintain a low impact on the natural environment and culture of an area while simultaneously generating income and employment for the local population. The Sprite project has examined the possibility of better integrated tourism in Europe's developing rural areas. Furthermore it has assessed the way in which tourism's connection to local/regional resources, activities, products and communities may be further developed.

A unified conceptual framework for analysing integrated tourism was created and

surveys were conducted on various actor groups such as tourists, businesses, communities and institutions. In this way, links between tourism and local resources as well as their integration with economic, social and cultural magnitude were examined in terms of integrated tourism's impacts and benefits.

The Sprite culture economy conceptual framework consists of seven dimensions. The methodology used to measure changes in the value of tourism and view of these changes is based on this framework. Sev-

eral key changes which affect the value of integrated tourism from 1992 to 2002 were found. These influential changes are infrastructure and facilities, policy, regulation and funding, structures, external event and promotion, image and quality. In the end, it was found that although tourism was beneficial to the areas studied, there are nevertheless certain areas, aspects and actors in which room for improvement remains.

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 > 4449

## Modelling the impact of cormorants on aquaculture

*A computer model proved indispensable for simulating the eating habits of the cormorant and thus determining its impact upon the local fishing industry.*

Cormorants inhabit coastal areas throughout Europe. Fish are a staple in the cormo-

rants' diet, which is why they frequently come into conflict with the fish farming industry that shares the same waters.

The FRAP consortium acquired funding from the EESD Programme to research methodologies for assessing such conflicts. The goal was to produce a balanced management plan that compromises neither nature nor aquaculture.

In the case of the cormorant, a proper assessment entailed quantifying the extent of the damage it can cause to a fish farm. The FRAP partners turned to food web modelling, specifically the Ecopath and Ecosim suite (<http://www.ecopath.org>). The modelling work was led by the Italian Agency for New Technology, Energy and the Environment (ENEA).

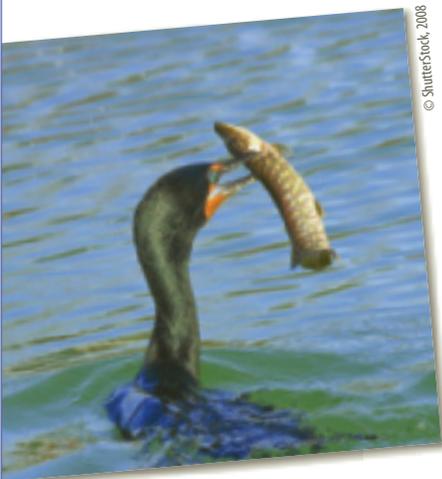
The modelling domain was limited to a lagoon ecosystem for which predator and prey data were available. Simulations were performed for the summertime as well as the winter period when the cormorant population, and thus damage, peaks. The mass-balance approach employed by the model helped establish accurate estimates of fishery losses.

ENEA and its FRAP partners plan to use this valuable information to create a reconciliation action plan to protect both the cormorant and the interests of the aquaculture industry.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4453



## Boosting the capabilities of emergency relief efforts

*Humanitarian relief efforts are often hampered by the inability of the different international and local bodies involved to properly communicate and share information. European researchers have come up with a new system to overcome this barrier.*

When a relief agency becomes involved in an emergency situation like the aftermath of an earthquake, typhoon or tsunami, it is vital to have as much information as possible so the mission planners know how to best use the resources at their disposal.

There have been efforts made by various international bodies, including the United Nations (UN) and the European Commission, to develop harmonised standards which make it possible for different organisations speaking different languages and using different technologies to access information such as satellite images, photographs and maps.

The EU-funded Stream project has taken this work a step further by creating an IT platform which supports all of these standards, and brings the different information together, so it can be accessed from a single entry point by everybody who needs to use it.

According to project coordinator Professor Hichem Sahli, the project has three main objectives. The first is workflow management to ensure the headquarters can monitor who is doing what and where. The second is creating a harmonised description of what people are doing, collecting information which can be shared by the different organisations in the field.

‘As things stand, you will often find two organisations working side by side who do not talk to each other. One may be assessing structural damage to buildings and infrastructure and the other dealing with the human cost in loss of life and outbreaks of disease.’

‘Even if they do talk, the data they are collecting is not made use of by both organisations because they are not coded in the same way and don’t have the same meanings, so there is a great deal of duplication of effort. So, we are ensuring harmonised data sharing, exchange, transfer and understanding,’ notes Professor Sahli.

Thirdly, Stream deals with data archiving and the free access to data by both decision-makers and field workers. Quite often when an outside agency responds to an emergency situation, it creates data, uses it for its own purposes and either takes it away or destroys it when pulling out, so nothing is left for the local bodies on the ground, explains Sahli. If the data is archived and freely available then there is a huge new resource for anybody who needs it.

Different modules have been designed for use in a remote headquarter where all the information is available to the mission planner, in an emergency centre in the country where the effort is taking place, and by field workers on laptops and PDAs.

Professor Sahli points out that Stream is intended to add value to existing systems and ways of doing things rather than replacing them, and should be seen by aid agencies and government bodies as an ‘extra resource’ rather than any form of competition.

‘From the very start of the project, we looked at what was being used, particularly by international relief bodies, and then made a list of additional requirements. We didn’t want to reinvent the emergency aid wheel, just to make it more efficient.’

Once the basic system had been developed and lab tested, field trials were undertaken in Lebanon and Angola. In Lebanon, the project looked at the aftermath of the 2006 fighting between Israel and Hezbollah, which destroyed a lot of buildings and infrastructure and made tens of thousands of people homeless.



Although a lot of data had been collected directly after the fighting finished, not all of it was still available. The project had to collect new data and feed both these and the old data into the Stream platform to develop scenarios of where to house displaced people and where to put up emergency centres.

In Angola, the project concentrated on mines left over from its civil war and the independence wars before that. ‘We went in prior to the hazard reduction phase to create a picture of which areas were the most dangerous and where the most urgent clearance was needed,’ says Professor Sahli. ‘We looked at old maps and updated them using recent satellite images, as well as having field surveyors on the ground to develop a complete and updated picture of the situation.’

The results of the trials are still being properly evaluated, he tells ICT Results, with the EU project having been given a five-month extension past the original end date of 30 June 2008.

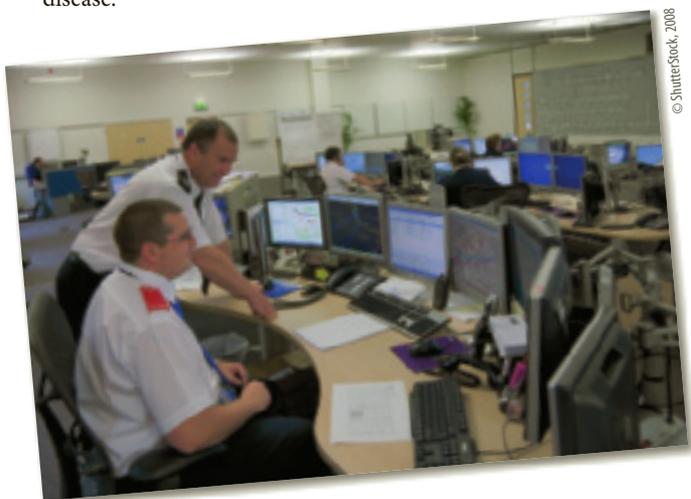
‘We are also putting together a business plan for future exploitation of the system by international aid agencies and those EU bodies which are involved in aid and emergency relief,’ he says.

A central database of all the information collected in different emergencies around the world would be of great help, so that the resource is there to help plan responses to similar emergencies elsewhere.

The end result might not be a safer world, but one in which rescue and help for victims of both natural and man-made catastrophes is conducted more efficiently.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90073>



## Multi-sensor instrumentation for monitoring landslides

*Precise, real-time detection of landslides can contribute to the design of more effective and timely emergency response efforts in the face of the oncoming disaster.*

Landslides are a type of natural hazard that may lead to loss of life and assets on a large scale. Being of national and international concern, the development of precise monitoring means for real-time detection and reporting of landslides is of prime importance.

Urged by this, the OASYS project aimed to develop an integrated optimisation of landslide alert systems. This could assist in the avoidance of loss of life, the minimisation

of destruction of property and the disruption of transport. In the long run, it would contribute, not only to the conservation of Europe's natural resources, but also to the economic advancement of poor regions.

The project focused on observation methods for detection of potential landslides, continuous monitoring of critical areas and gathering of real-time information about actual risk. Part of the project work involved the development of an advanced evaluation tool

for landslide monitoring on a local scale. Geodata and TU Wien, project partners, joined forces and generated a robust multi-sensor system for landslide monitoring.

The advanced evaluation tool comprises a piezometer, an inclinometer, a surface extensometer, three tilt meters and six accelerometers. Having been installed in a suitable location in the opencast Hambach mine in Cologne, it was tested extensively.

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 > 4017

## Geo-information processing for landslide monitoring

*When locations for construction and their alternatives need to be chosen, the first step would be to recognise the existence of a landslide prone area. For accurately distinguishing landslide causes and activity, the detection of mass movements should however be based upon thorough geomorphological and geological investigations.*

OASYS, a multidisciplinary project funded within FP5, aimed to collect as much information as possible for an advanced knowledge-based monitoring system. In a first step, remote sensing data had to be combined with geodetic deformation measurements carried out to detect surface traces of fractures and fault ruptures. High-precision geotechnical measurement systems were then installed on the boundaries between stable and unstable areas.

The multi-scale observation concept was successfully applied in the test area selected in north western Greece, where landslide-prone zones were reduced step by step. The Prinotopa landslide area, intersected by the Egnatia motorway, is resurfaced due to snow melt and heavy rainfall every spring, as well as large earthquakes. The treatment of data from the heterogeneous geo-information systems (GIS) network with the SYSDeform software contributed decisively in the almost real-time estimation of critical parameters.

Because of the variety of factors contributing to mass movements, excessive volumes of data had to be analysed. Apart from the data collection and processing, the possibility of selecting different spatial analysis methodologies and implementing numerical models was provided by the custom-made software SYSDeform. Developed at the Aristotle University of Thessaloniki, it provided a variety of approaches for monitoring high-risk areas. The capabilities of SYSDeform reach further, from data capture and creation of natural hazards inventories to performing user-defined computations of landslide hazard maps.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4385

## Biotests measure ecotoxicity in stormwater

*Biotests were used to determine levels of ecotoxicity in samples of stormwater. The investigation was believed to be the largest of its kind.*

The Daywater project carried out a major study into the potential biological or chemical stress placed by stormwater on ecosystems. The environmental impact was found to vary between storms at each sampling site and between the sites themselves. The effect also varied according to the type of test organism studied.

A series of biotests were carried out by the EU-funded project Daywater using Microtox, algal and rotifer tests. The Microtox test uses a luminescent bacterium which, when damaged by pollutants, emanates less light. The results showed that of the three tests administered the Microtox test was the most sensitive when measuring toxicity levels.

However, use of a range of biotests resulted in a higher detection rate than merely relying on a single test. This approach enabled toxicity to be detected in whole samples and for samples to be ranked according to their toxicity.

Addition of the chelating agent ethylene diamine tetraacetic acid (EDTA) was found to reduce sample toxicity. The conclusion was that metals make a major contribution to toxicity, with concentrations of metals varying between storm events. Resuspension tests indicated a possible toxic effect as a result of contaminants bound to sediments. In the future, toxicity tests and chemical analysis should be applied to sediments

and runoff water in order to identify any pollutants present. At the time of the study, mainly chemical analysis was used to assess hazard and vulnerability to stormwater discharges. Chemical analysis however supplies information regarding a single compound rather than the toxicity of a whole sample.

Therefore, the work undertaken by Daywater underlines the importance of biotests for detecting and ranking toxicity for whole stormwater samples and for studying the vulnerability of ecosystems. The project recommended that a biotest approach be included in any regulatory framework, particularly when setting up a monitoring strategy.

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 > 4366

## Infraplan: good to the last drop

*The Infraplan model incorporates complex theory describing the relationship between humans and natural resources in order to help regions develop sustainable strategies for the exploitation of their water resources.*

The Tigress project, led by the University of Newcastle upon Tyne, was funded by the EESD programme. It envisioned the application of innovative time-geographical concepts to foster the creation of sustainable societies.

A number of case studies were performed during the three-year project, including one dedicated to water resources. The M11 corridor in southeast England has been identified as a candidate for intensive residential development over the next decade. The region's water resources and infrastructure, which are already stressed, will come under increasing pressure as the population skyrockets.

One of the keys to successful water management is matching supply to demand. Lack

of a proper balance between the two can lead to water shortages or, alternatively, water quality issues. The ability to accurately predict future water needs is also important.

With these constraints in mind, the University of Newcastle upon Tyne and its partners set about developing a model unlike any other to date. It uses special algorithms to manipulate demographic and other data to provide decision support to the authorities, water utilities and other stakeholders.

More information about the Infraplan model and the case study can be found at <http://www.tigress.ac/reports/final/infraplan.pdf>



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

Collaboration sought: joint venture agreement.

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## Solar treatment with a catalyst for clean water

*The importance to health of a fresh uncontaminated water supply, particularly in developing countries, cannot be overstated. The European project Aquacat has investigated a new low-cost treatment method for the disinfection of water supplies.*

Every year, there are 4 billion cases of diarrhoea caused by pathogenic organisms in contaminated water supplies. Of these, 2.2 million people die and most are children. The result of infection is extreme dehydration and malnutrition can result from chronic cases. Timely treatment of infections, especially in poorer countries,

can be difficult. Effective water sterilisation is the answer to this problem.

During the early 1990s, a cheap effective water treatment known as SODIS was developed which harnessed the synergistic effects of the Sun and heating on water. This involves simply placing the infected water in plastic bottles and placing in full sunlight if possible. The method has proved highly successful and incidence of cases has been reduced by 30 to 80 %.



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However, the water sterilised by this method can be unsuitable for storage. The Aquacat project therefore took up the challenge to find a further cost-effective method where microbial regrowth after disinfection was reduced.

The method investigated was based on heterogeneous photocatalysis using titanium dioxide (TiO<sub>2</sub>) sol-gel films over glass rings. To test the method, the Swiss team based at École polytechnique fédérale de Lausanne took naturally infected spring water. It was then exposed to sunlight in plastic bottles. Water from the different treatments was then assessed for fecal coliforms using the defined substrate test. This involves a colour change which indicates the presence of coliform bacteria.

The method using heterogeneous catalysis proved to be more effective against all coliforms than the SODIS technique. For example, on a sunny day, using immobilised TiO<sub>2</sub>, it took half the time to achieve the same level of disinfection obtained with SODIS. Moreover, no regrowth for total or fecal coliforms was observed and water was kept free from contamination for seven days.

The potential advantages of disinfected water that can be stored are self-evident. In arid and semi-arid areas and where conventional means of water treatment have temporarily broken down, this is a cheap and simple alternative. There is also no requirement for trained staff or expensive infrastructure.

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 > 4168

## The economics of pyrolysis oil

*Research by VTT in Finland has indicated that investing in biofuels, specifically pyrolysis oil (PO), makes good economic as well as environmental sense.*

PO, a by-product of high temperature combustion of biomass, is one of many biofuels under investigation in Europe. VTT, a technology leader, coordinated an EESD project entitled Combio to assess the technical and financial viability of PO.

Once fuel specifications were established and combustion properties were studied, VTT performed an extensive economic analysis of PO's competitiveness versus conventional fuels. The case study involved the

introduction of a pyrolysis unit to a combined heat and power (CHP) plant fitted with a fluidised bed boiler.

To determine the return on such an investment, VTT employed various econometric tools. For instance, the annuity method was used to determine the production costs associated with PO. In addition, the internal rate of return (IRR) was calculated to provide insight into the payback period. Current prices of light and heavy fuel oil were

used while the price of PO was adjusted downwards to account for the added transportation and utilisation costs.

VTT computed an attractive pre-tax IRR of 10 %. Sensitivity tests revealed that IRR is susceptible to price fluctuations and PO output, but not particularly dependent on the initial outlay of capital.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4395

## Studying the Norwegian Atlantic current

*An extensive monitoring campaign in the Nordic Seas funded by the EESD programme revealed some unexpected results.*

The Norwegian Atlantic current delivers relatively warm water from the Gulf Stream to the Nordic Seas, moderating the local climate considerably. It is suspected that climate change may disrupt this important circulation, possibly plunging the region into a colder regime. Accurate prediction of such an event requires an intimate understanding of the current.

This was the aim of ASOF-N, a component of the 'Arctic-subarctic ocean flux' (ASOF) research programme dedicated to the northern Atlantic. The Laboratoire d'océanographie et du climat (Locean) col-

laborated with other ASOF-N partners to obtain new measurement data from the Nordic Seas. Eulerian (moorings), Lagrangian (floats) and ship-based methods were used to study the Norwegian Atlantic current in detail between 2003 and 2005.

The French oceanographers and their colleagues discovered that, contrary to common thinking, the current is not a narrow jet. Rather it is a broad, turbulent current with intense eddy activity and episodic fluctuations in temperature and salinity. The same was also true of the West Spitsbergen current.

With respect to the evolution of the Norwegian Atlantic current over time, significant inter-annual variability was observed. In addition, Locean detected a temperature increase on the order of 0.5 °C as well as a rise in salinity over the past quarter century.

Further research is necessary to determine the possible impact of this trend on the thermohaline circulation in the North Atlantic. These findings may also be of interest to marine biologists given the highly productive nature of the Nordic Seas.

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 > 4399

## Promoting conservation of seal populations in Finland

*Baltic seal populations drastically declined in the 1970s and 1980s due to excessive hunting and environmental pollutants. This research sets out to readdress the balance and promote conservation by mitigating between conflicting interests when it comes to fisheries and the grey seal.*



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The seal is an opportunistic feeder and hunts fish, molluscs and crustaceans. Some seals such as the monk seal have been classified as endangered and others such as the grey seal are often protected by conservation laws. The conservation of seal populations is bound up with the state of its natural habitat but also with the state of competition it faces in attaining its food supply.

This research focused on conservation of the grey seal population in a coastal area of Finland. The team's main aim was to find a suitable solution to the conflict of interest that exists between the coastal fishing industry and seal conservationists. The solution involved advancing the regional action plan. The scope of the action plan required the active participation of all the stakeholders involved.

The FRAP project worked on building a framework for making an ecological and socio-economic assessment of the positive and negative effects of interaction between fisheries and the conservation of fish-eating vertebrates. This research has enabled the development of compensation strategies that are efficient but also ecological.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4419

## Preparing communities for Arctic warming

*As climate change takes hold, it is the communities that make a living from the marine ecosystem which will be amongst the most affected. This project aimed to communicate scientifically predicted changes to a general public that will need to adapt.*

In the Barents Sea, the Arctic Ocean north of Norway and Russia, the temperature is anomalously warm for its latitude. This is maintained by a variety of processes. As the heat flux in the region changes, so does the marine ecosystem. This marks the start of

a process which will see changes in species composition, distribution and migration of commercially important fish species. In the region of northern Norway, which was the topic of study of the ASOF-N project, there exists an economic, social and cultural heritage built upon these fertile fishing grounds. As these conditions change, it is important that communities are informed in advance so that they have time to adapt.

ASOF-N scientists observed and recorded the changes which are occurring in the region. The aim was to understand the controlling processes at work in this high latitude area. The measurements recorded showed a great variability of heat flux to the Barents Sea. The data

collected was also compared with models with predictive capability.

The findings were then disseminated to decision-takers and the general public. Talks took place and fishing organisations were briefed on the content and conclusions. Articles were written in local newspapers and specialised publications and a leaflet was produced and disseminated. Another initiative geared at the general public was organised so that school teachers were briefed on how they can explain this information to their students and talks took place at universities.

A report was also produced which was distributed at high-level conferences, with the aim of informing decision-takers. The report provided background for the 'Arctic climate impact assessment' and reports produced by the International Council for the Exploration of the Sea (ICES).

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

Collaboration sought: further research or development support.

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## Freshwater output from the Arctic

*Freshwater exported from the Arctic to subarctic seas has the potential to affect north-bound currents because of changes in water density. This would affect oceanic heat transport, which in turn would influence the climate of northwest Europe.*

The climate of northwest Europe is unusually warm given its latitude. This warmth is the result of a number of oceanic processes centred in the Nordic Seas and the Arctic. Over the last 50 years Arctic warming has been three times greater than the global increase in surface temperature. The aim of the ASOF-N project has been to understand the processes controlling climate change in the highest latitudes of the North Atlantic.

The ASOF-N project measured freshwater flux through the Fram Strait, a sea channel connecting the Arctic Ocean and the Nordic Seas, running between Greenland and Spitsbergen. Fram Strait is the passageway where most drifting sea ice exits the Arctic. It is also the main provider of freshwater to the Labrador Sea and North Atlantic, together with the Davis Strait.

In order for seasonal freshwater fluxes to be measured, high-resolution spatial data was required. However, extensive ice cover pre-

vented access to the region during winter. This problem was overcome when a coast-guard icebreaker was used to penetrate into the ice. The ship also served as a base for measuring conductivity, temperature and depth of the sea thus enabling ASOF-N to carry out the first high-resolution wintertime hydrographic observations.

Results from computer models were used to fill temporal and spatial gaps in the observations and to link freshwater fluxes in the East Greenland current (EGC) with large-scale oceanic circulation. The findings made by ASOF-N will be valuable to climate scientists, since freshwater from the Arctic is believed to influence the

density of seawater at high latitudes. This in turn influences currents governing oceanic heat transport to northern regions. The information will also help experts advising governments on climate change to better understand the link between freshwater output from the Arctic and climate systems.

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

Collaboration sought: further research or development support.

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## Modelling waterways in semi-arid regions

*The challenge of modelling transient waterways has been met by the tempQsim consortium and their suite of three models: Pscas, tempQsim-stream and tempQsim-reach.*

Semi-arid regions, such as those bordering the Mediterranean Sea, have sporadic, but at times intense, rainfall. This situation complicates the application of watershed models designed for continuous flow.

The University of Hannover coordinated a multi-million Euro research project entitled tempQsim dedicated to developing new software tools appropriate for temporary streams. Rather than come up with one single model, the group of fourteen partners

resorted to a suite of complementary models of varying scale.

The catchment model, called Pscas, examines the effects of large-scale changes in land use and climate parameters. Computing requirements are kept to a minimum by limiting the temporal and spatial resolution of the model. Pscas is designed to address long-term water management concerns.



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## Improving water management in the Mediterranean

*The EU-funded tempQsim project was set up to facilitate improvements in water and environmental management models of temporary streams in southern Europe. A booklet has now been published which outlines the key findings as applied to case studies carried out in six EU Member States.*

The project aimed to improve the efficiency of water management strategies currently used in the Mediterranean and in semi-arid river catchments. The focus was on developing new hydrological and sediment modules. These were tested rigorously at various Mediterranean case study sites in Bulgaria, Greece, Spain, France, Italy and Portugal. The experience gained from these case studies has been used to prepare guidelines for adapted monitoring, modelling and management strategies.

Since completion of the project, a booklet has been produced to summarise the results. It is entitled *Critical issues in the water quality dynamics of temporary waters. Evaluation and recommendations from the tempQsim project.*

It outlines the findings of the individual case studies as well as discussions related to overall

themes. In the case of Portugal, a description of the Pardelia watershed is given. The case study addresses the impact of remaining natural pools and the application of the tempQsim-stream model. Other examples include Albujo in Spain and Vene in southern France, where for the latter, a description addresses the impact of wastewater discharges to a temporary stream as well as the influence of the Karst system. In the Bulgarian case study, a description is given of the Iskar watershed introducing the interaction of lower and upper parts of the basin, as well as the applicability of the HSPF drainage model.

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

Collaboration sought: further research or development support.

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For situations requiring a higher level of detail, the consortium produced the tempQsim-stream model. It employs a mass balance approach to simulate mass accumulation during periods of little to no rain. The model hydrodynamics enable the treatment of water pools, including those deriving from local sources of pollution. Special attention is also paid to the non-linear transformation from dry to flow conditions following the first significant rainfall event.

Finally, the tempQsim-reach model deals with complex biogeochemical, hydrological and sediment transport aspects at the reach scale. It is capable of simulating the time evolution of water quality of temporary rivers.

During the project, the models were tested out on the eight tempQsim research catchments. Further to these developments, the University of Hannover and its partners have applied for copyright protection for the suite of models.

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

Collaboration sought: further research or development support.

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## Designing sustainability policies

*A book written by researchers based in Austria investigates the issue of modelling sustainable development for Europe. It has been published as part of the Transust project.*

The objective of this book is to explore a potentially successful strategy to design sustainability policies, taking sustainability aspects and requirements appropriately into account. In the last decades sustainability has become an increasingly important guideline for economic, social and environmental processes. For more than a decade, the EU has taken a leading role in the promotion of sustainable development, as is emphasised by various key political decisions put in place in the Maastricht Treaty (1992).

At the Lisbon Summit in March 2000, a new strategic goal for the EU was established. The European Council formulated a 10-year strategy to make the EU the world's most dynamic and competitive economy. Under the strategy, a stronger economy will drive job creation alongside social and environmental policies that ensure sustainable development and social inclusion.

The book stresses that, in order to appropriately implement the concept and lead the world towards a sustainable path, the wider notion of sustainability needs to be taken

into account. The direction taken must also acknowledge the original intention of the pioneers of the World Commission on the Environment and Development (WCED). It goes on to discuss the transition to innovative economic structures and the major challenge to economic policy design this poses. Furthermore, it stresses the need for an energetic implementation of reform in all the different spheres through integrated strategies.

It highlights the fact that insufficient implementation of the Lisbon strategy could produce significant net costs for the EU. For example, in terms of reduced economic welfare and a growing gap with some of the large industrial partners in the fields of

education and R & D. In order to promote progress towards the Lisbon targets, better ways of incorporating the broader aspects of sustainability are required.

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

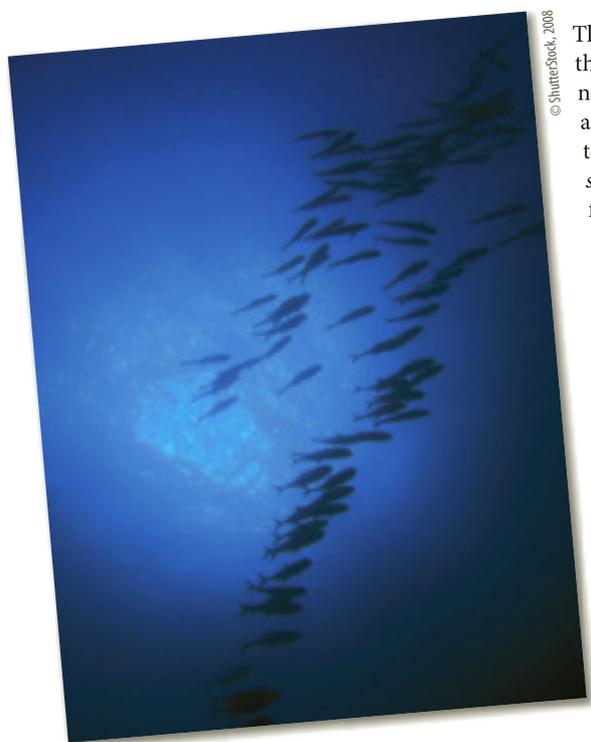
Collaboration sought: further research or development support.

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## Effect of environment on sprat bioenergetics model

*Bioenergetics, the flow of energy through living systems, has been used to explain behaviour in European sprat. The Ethofish project developed a bioenergetics model which included the flow of both energy and oxygen through the system.*



The Ethofish project investigated the relationship between internal physiological constraints and external environmental factors in European sprat (*Sprattus sprattus*). Oxygen, necessary for metabolism, comes from aerobic respiration or the build up of anaerobic lactate. However, an increase in lactate reduced the fishes' swimming ability, making them more vulnerable to predators. Water containing low levels of oxygen has fewer predators, but reduces the sprat's ability to feed and digest food efficiently. The model studied how individual fish balance oxygen and energy flows and the risk of predation and starvation throughout the entire water column.

Sprat actively exploited the distribution of light and oxygen saturation in the water column to increase their chance of survival. During the day they remained in deep water, which had low levels of oxygen and provided safety due to a predator scarcity. Encounters with predators were rarer at night, when the sprat rose from the depths in search of water with higher oxygen content. The results underlined the importance of integrating the fishes' internal physiology with their external ecology. This allowed both the individual behavioural and population level response of the sprat to be properly understood under conditions of environmental stress.

The project increased knowledge of the behavioural and physiological processes that control the relationship between environmental factors and the sprat's ecology. This knowledge is invaluable for predicting the effect of environmental perturbations on the marine ecosystem and for developing the necessary environmental regulations.

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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## DNA-based nanoelectronics

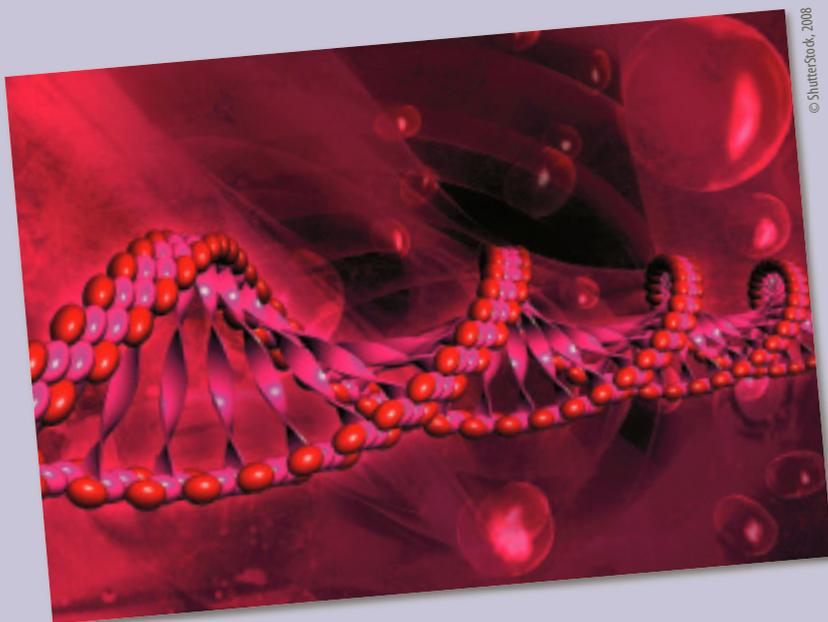
*The unprecedented progress of the electronics industry in the past decades has been based on the delivery of smaller devices and denser integrated circuits, which promise even more powerful computers. However, future growth is compromised by the intrinsic limitations of conventional technology.*

The 'DNA based nanowires' project, involving an international consortium of seven universities and research centres, was funded under FP5 to search for an alternative to silicon-based microelectronics. DNA and its derivatives enable packing of enormous densities of information and more importantly, can be accurately synthesised as well as manipulated.

The ultimate aim of the project partners, led by Tel Aviv University was to develop DNA-based conductive nanowires for nanoelectronic devices. DNA is in itself probably not a good conductor and a molecular wire is characterised by limited ability to trans-

port electrical charges. However, DNA-based structures such as G4-DNA may offer the desired conductive properties.

G4-DNA is a highly stable DNA molecule made of consecutive planar arrangements of four guanine (dG) bases, connected with poly-dG strands and stabilised by metal ions. Experimental and theoretical research groups with Tel Aviv University succeeded in producing a novel G4-DNA nanowire that showed encouraging conductivity signals, while preserving recognition and specific structuring qualities.



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The method proposed for synthesising a one-to-one double helical complex of two polydeoxyguanylate [poly(dG)] and polydeoxycytidylate [poly(dC)] strands yielded a uniform polymer with a high guanine content. Guanine, with the lowest ionisation potential among DNA bases, promoted electric charge transport and made the polymer a good candidate for use in nanoelectronics.

A detailed description of the enzymatic synthesis of the poly(dG) – poly(dC) molecules of controllable quality and length ranging between hundreds of nanometres up to micrometres has been made publicly available. The article published in the peer-reviewed *Nucleic Acids Research* journal is freely available.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4394

## Wheelchair simulation environment

*Wheelchairs have come a long way in catering to the disabled, offering automated features, joystick control and braking systems. In some cases their success has outdone many users' ability to operate their wheelchair successfully. This may be simply because users may not know, or have difficulty in using these haptic devices.*

Navigating spaces, especially the usual spaces found in the average home, can be a considerable challenge for disabled people operating wheelchairs. Simple reversing, turning and even braking procedures can become challenges. I-match, an EU-funded project, developed a simulator that not only enhances a user's ability with the chair, but is capable of assessing user preference in order to customise the controls.

The 'I-match wheelchair simulation software' uses both kinematics and accurate dynamic models to provide the most realistic simulation environment possible. The virtual environment models a standard home-based surrounding, and also provides support for various PC-based input

devices such as keyboard, mouse and joystick.

The idea behind the development is to train the user in the most familiar (and realistic) environment possible. The simulation also provides the user with different wheelchair control scenarios. At the same time it also affords the opportunity for users to assess the various control devices and to choose that which is most suitable for them.

Not being a one solution fits all, the simulator is geared with various parameters that can be adapted to provide realistic simulation for a number of different wheelchairs. This is a vital aspect, as wheelchairs need in every fashion and concept, to fit like a glove.



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

Collaboration sought: information exchange/training.

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## Helping the disabled make use of public transport

*In an ideal world, all buses would be wheelchair-friendly and train timetables would be available as audio recordings for the visually impaired. Reality has yet to catch up with that vision, so instead European researchers have developed a personal navigation aid to help disabled people make use of public transport.*

By letting disabled people know in advance which bus routes, subway lines or rail links are disabled-friendly, people with disabilities can plan journeys that they may otherwise be unable to make unassisted. Once on the move, location-based services accessed via a smart phone or handheld computer can highlight points of interest, warn them of potential obstacles and let them change their itinerary as needs be.

'Until you meet with disabled people and talk to them about their needs it is hard to imagine just how difficult using public transport is', notes Gary Randall, a researcher at BMT in the United Kingdom. 'They are scared of finding themselves isolated, of being abandoned in the world.'

Someone confined to a wheelchair, for example, may end up stuck at a bus stop many kilometres from home if a bus with wheelchair access never arrives, or a blind person could easily become lost trying to make a train connection if there is no one to assist him or her. For that reason, few disabled people use public transport alone in what constitutes a severe restriction of their freedom and autonomy.

To address that problem, researchers working in the EU-funded Mapped project developed personal navigation software designed specifically to meet the needs of people with disabilities. The system extends technology used in now commonplace GPS navigation aids. It incorporates information about pub-

lic transport timetables and routes as well as so-called points of interest to disabled people in what the researchers describe as the first application of its kind.

'A point of interest for someone with a disability is often very different from what [it] would be for you or me', says Randall who coordinated the initiative.

He notes, for example, that someone with limited mobility would want to know if a building has an elevator or if you have to go up steps to enter a restaurant, while a blind person would find it useful to know in advance if a certain supermarket has someone available to help with their shopping. That information is obtained wirelessly from a preloaded database. The data is then presented to the user in a variety of formats tailored to their individual needs, including visual maps and audio instructions.

'Curiously, despite the wide variety of disabilities, we found that the needs of different groups of test users were very similar regardless of whether they were in a wheelchair, visually impaired or had hearing disabilities', Randall says. 'They all want the reassurance that having a personal navigation aid can provide.'

In trials in Dublin and in Winchester in the United Kingdom, people with different types of disabilities tested different versions of the system. Their reactions were generally positive, with 84 %

saying they would find a route planner such as that developed in Mapped useful in their daily lives. Nonetheless, the trials identified several challenges that must be overcome before such a system goes into commercial use.

Users tended to find the off-the-shelf



PDA on which the software was installed difficult to use because of its small buttons and screen, while the accuracy and reliability of the GPS information needs to be improved to make micro-level route planning effective. New mobile devices with better user interfaces and incorporating digital compasses, coupled with the roll-out of Europe's more accurate Galileo satellite positioning system should solve those problems over the coming years.

'Usability and reliability are obviously crucial', Randall says. An even bigger problem, however, may be gathering the information about public transport routes, timetables and, especially, the accessibility features of museums, restaurants, shops and other points of interest. 'For the trials, we had to go around and visit restaurants and cinemas individually to see what their accesses were like — that is evidently not a practical solution', Randall notes.

Instead, the researchers have considered allowing users to add their own content or working with business directories to obtain the information. In light of the challenges, Randall believes public-sector support will be essential if a navigation aid such as that developed in Mapped, which was funded under the Sixth Framework Programme (FP6), is to be widely used.

In that vein, he foresees the system or elements of it being deployed in different European cities where local governments have the political will to make location-based services for disabled people, tourists and other users available.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90069>



## Innovative solutions for unified communications

*Due to the ongoing massive growth of the internet, the latest internet protocol version 6 (IPv6) is considered as a key technology for the delivery of next generation communications.*

6NET was the largest European project to demonstrate that continued growth of the internet can be met by using new IPv6 technology. However, regardless of the numerous advantages of deploying IPv6 technology, IPv6-only networks will only be introduced gradually. During the relatively long transition period IPv4 and IPv6 networks will need to coexist and be able to communicate with each other.

In this context, research work at the Fraunhofer Institute for Open Communication Systems (FOKUS) focused on providing a technical solution that would enable voice over IP (VoIP) services beyond IPv4 networks. VoIP offers a promising alternative to conventional telephone services, but also a rich suite of IP-based services, such as instant messaging, multimedia conferences and application data exchange. To support VoIP services between IPv4 and IPv6 networks, the session initiation protocol (SIP) was deployed.

SIP has been designed as a multimedia protocol that could take advantage of the distributed

architecture of popular internet applications, with URLs for naming and text-based messaging. As a protocol only, SIP defines how sessions, including telephone calls, are to be created, modified and terminated. To authenticate registered users before establishing a VoIP session, the open-source SIP express router (SER) was extended to serve as an access control element in an IPv6 network.

To support communication between IPv4 only networks and IPv6 only networks, a dedicated gateway was developed for translating and routing SIP messages. Finally, an adequate replacement of high-end phones was developed, supporting the integration of internet telephony service into a PC. The Bonephone is a software application designed to allow easy customisation to the specific needs of a user and importantly, to be used over different hard- and software platforms.



## Monitoring applications on the grid

*Whilst existing solutions only enabled applications to be run on the grid in a batch, the Crossgrid project has supported the concept of interactive grid computing.*

Grid technologies have extended cluster and distributed computing concepts to allow more efficient sharing of all available resources. Today's grids consist of high-end computers and workstations, storage systems and databases that work in tandem across private and public networks. Their most distinguishing feature is that they are configured from components managed by independent organisations.

The Crossgrid project was funded under FP5 to implement new grid components and support applications that require high computational resources for handling excessive amounts of data. Research institutes from

11 European countries joined their forces to develop grid-based systems for pretreatment planning in surgical procedures, as well as decision support systems for weather forecast and flood prevention.

All these applications required new tools for monitoring the application's performance, providing authorised access to distributed data and managing resources engaged to run the application. To provide users that have limited knowledge of the underlying grid technology with access to advanced grid services, an 'application portal' was developed by project partner Algosystems S.A.



This is a web-based interface with multiple portlets, through which the potential user would be able to submit jobs to the grid. First, the user is authorised to use the facilities of the portal by authenticat-

The public was encouraged to access a VoIP server through the popular [www.iptel.gr](http://www.iptel.gr) website, where they could request a VoIP identity and put to the test VoIP services from their IPv6 network. Over the course of the 6NET project the deployed systems had demonstrated the versatility required from VoIP systems, operating seamlessly between IPv4 and IPv6 networks.

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

Collaboration sought: further research or development support.

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ing or obtaining their own security credentials stored in a MyProxy server. As soon as a valid certificate and private keys are retrieved through the 'Proxy manager' portlet, information from a wide variety of sources is made available in an easy to use manner.

Information on computing elements in the grid that can meet the requirements of jobs specified is made available through the 'Job list match' portlet. Furthermore, the status of previously submitted jobs can be found out with the use of the 'Job log info' portlet. Each portlet has been designed to manipulate and display data almost independently, as if it was a webpage on its own.

These software tools continue to be supported beyond the end of the end of the Crossgrid project. Moreover, solutions proposed within the Crossgrid project are being adopted by further research initiatives under FP6.

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

Collaboration sought: further research or development support.

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## From data to knowledge

*As researchers find themselves overwhelmed with data, but lack the means to retrieve the information of interest, an innovative approach to knowledge discovery in databases has been explored.*

Perhaps data explosion is the most characteristic feature of science at the start of the third millennium. From particle physics to molecular biology, from neurology to astronomy, almost all experimental sciences are experiencing an unprecedented increase in the amount and complexity of available data. Within these databases lies an abundance of scientific knowledge that is accumulated by sophisticated instrumentation, and by ever more powerful information technology.

An innovative approach was adopted within the CINC project to analyse such a vast volume of data which do not constitute information per se and do not allow any kind of easy management. To support the knowledge discovery process, intelligent data mining algorithms were developed to extract knowledge artefacts providing a compact and semantically rich representation of heterogeneous raw data. Looking for a tighter integration between data and knowledge artefacts which hold in the data,

CINC project partners employed the concept of inductive databases.

In inductive databases, ordinary queries could be used to access and manipulate data, while inductive queries enabled extraction of patterns such as items frequently appearing together and association rules. Knowledge discovery in inductive databases therefore becomes an extended querying process which the analyst can control by specifying the data or patterns of interest. The quest for the appropriate query language was among the goals of the CINC project that is being further pursued in the current IQ project, funded under FP6.

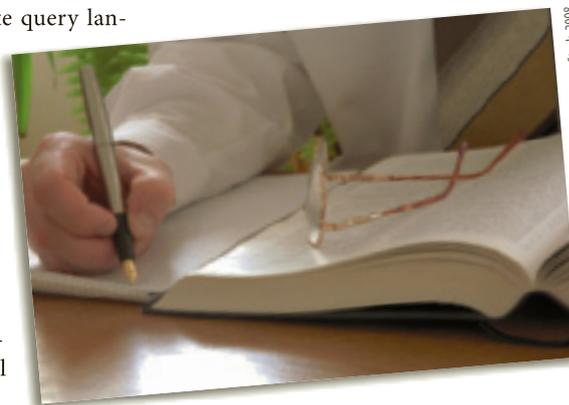
Although many efforts have been devoted to the application of pattern queries for extracting information available in webpages, the scientific challenges in functional

genomics received the CINC project's attention. Most of the available analysis techniques of gene expression data are based on clustering algorithms that try to establish groups of genes whose expression is correlated in different biological situations. As their biological validity can be questioned, exploratory data mining algorithms that seek descriptive rules in data collected by serial analysis of gene expression (SAGE) or from DNA microarrays were proposed.

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

Collaboration sought: further research or development support.

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## Paving the way to quantum computing

*Quantum computing requires the ability to manipulate individual quantum bits (qubits) as well as coupled qubits. Coupled superconducting qubits have been fabricated within the Squbit-2 project in a manner that can be controlled by using electromagnetic pulses to control the magnetic flux through their closed circuits.*

In the emerging field of quantum information processing, superconducting devices are promising candidates for the implementation of qubits. While macroscopic in size, they are characterised by generic quantum properties such as quantised energy levels and superposition of energy states, which

are commonly associated with atoms. As such, superconducting qubits might one day form the fundamental building blocks of quantum computers.

But before then, a technology that combines the necessary level of control over two-level quantum systems with the possibility of mass production needs to be developed. Furthermore, for a quantum computer to realise its full potential, quantum information contained in the states of thousands of interacting qubits would have to be manipulated. The Squbit-2 project partners at the Delft University of Technology in the Netherlands have made important progress towards this goal.

Researchers focused on standard flux qubits, made by joining Josephson joints with superconducting leads to form a closed circuit. When a magnetic field was applied perpendicular to the closed circuit, two quantum superposition states were formed as the current circulated in two different directions. Measurements of the microwave radiation emitted, made with a superconduct-

ing quantum interference device (SQUID), provided evidence of the symmetric and antisymmetric superposition states.

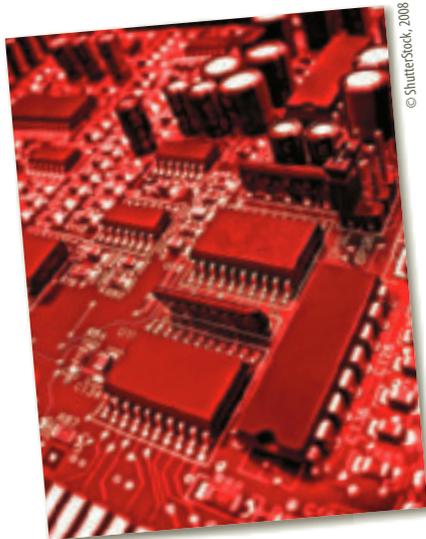
These experiments provided the first spectroscopic measurements on two coupled flux qubits and the means to measure how long the system remained coherent. However, the most important feature is the number of quantum operations that can be performed before quantum coherence disappears. Since each pulse manipulating flux qubits can be as short as 1 nanosecond, it should be possible to perform hundreds of operations, significantly less than the number a quantum computer would need to perform.

The need for better ways to couple qubits with each other, and also with their environment was made evident. Efforts have already turned to improved fabrication techniques to reduce the defects in the junction barriers and increase decoherence times. It remains to be seen if superconducting qubits can be accurately controlled and if quantum computers made from superconducting qubits can be successfully scaled up.

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 > 4424



## Is it a bird, is it a plane? No it's supercopter

*Unmanned helicopters could soon be a key part of emergency relief operations, as well as bringing a new dimension to filmmaking, thanks to some innovative work done by European researchers.*

When natural disasters happen one of the first casualties is often the communications network. As a result, rapid response crews can be working virtually blind, cut off from each other and the victims they are trying to help.

Where there are transport arteries, such as roads, rivers and railways, they are also very often damaged or disrupted, which makes getting medical and relief supplies to survivors extremely difficult. When such disasters happen in remote areas with little in the way of communications or transport infrastructure to start with, the problem is exacerbated.

A solution for both the communications and delivery of supplies problems is now being researched in an EU-funded project, called AWARE, which comprises academic and commercial partners from five EU Member States.

Project coordinator Professor Anibal Ollero says a key part of the system being developed is a self-deploying sensor network. 'Most sensor network applications assume there is a communications infrastructure, and so one challenge was to devise a system which can cope when there is no such infrastructure or it has been damaged', he says.

Helicopters were chosen as the aerial component of the project because of their manoeuvrability and ability to hover. This means they can drop sensor nodes off exactly where they are required, automatically calculating where the gaps are and building up a new communications infrastructure. They are also able to function as aerial communications relays, and trans-

mit live photographs of exactly what is happening on the ground. These images are then processed in real time and the results are combined with information from sensor nodes and ground cameras to create a detailed picture that facilitates detection, localisation and tracking. Finally, helicopters can also be used to carry loads, such as medical supplies, and deliver them to exact locations.

Professor Ollero points out the aim of the project was to develop the software, middleware and functionalities of a control system for autonomous unmanned helicopters coupled with a ground wireless sensor network with both fixed nodes and nodes carried by vehicles and people. 'This is primarily an IT project so we did not concentrate so much on the helicopters' airframes as on a scalable control system which, in the future, could be used on a larger scale', he notes.

The actual helicopters used were less than 2 m in diameter, but were still able to prove the potential of the system in real-life simulations. 'The first trial was in March 2007, and the feedback from this allowed us to complete the system design. Then in April 2008, we had another field trial which allowed partial integration of the various subsystems in the field. A final, fully integrated demonstration will be held in the spring of 2009, just before the project ends', Professor Ollero says.

The FP6-funded project has already been able to demonstrate a world first for either manned or unmanned helicopters by having a load too heavy for one helicopter alone carried by three autonomous unmanned helicopters working together. 'It is very difficult to coordinate the helicopters, so this was a very ambitious objective of the project', he says.

Professor Ollero points out it is also important for the bottom line, as the

cost of helicopters increases exponentially with the payload capacity and sharing loads means smaller helicopters can be used. Future applications of the system will include continuous outdoor and indoor monitoring and tracking of people by using cameras and communications nodes both on the ground and in unmanned helicopters.

As an example, he says the system can detect a fire, localise it and monitor it. Fire fighters can be tracked and monitored inside or outside, and local sensors can provide information on factors like temperature and humidity to reinforce the images produced by cameras. As well as reacting to emergencies and disasters, there are also obvious applications in counter terrorism operations.

Two of the project partners, Flying-Cam S.A. of Belgium and the Technical University of Berlin, have already made an agreement to commercialise the technology jointly with particular emphasis on developing new products for the film industry, Professor Ollero says. There is also already a lot of interest in the system from both potential end-users, such as fire and police departments, aid agencies and the media, as well as from the commercial organisations which supply equipment and services to them.

'We have invited all of these organisations to the demonstrations and they will be present at the final demonstration next year', says Professor Ollero. 'Both the people who could use the system we have developed and the companies who can commercialise it and provide it to them are in the loop and interested in carrying on', he says.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tp/article/id/90087>



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## Sophisticated robots

*Presence, as the perception of self in the environment, has always been considered to be an intrinsically human characteristic. A group of scientists based in Italy set to work to recreate this characteristic and have come up with a device capable of performing the sophisticated manipulation skills of the human hand.*

There are 29 major joints in the human hand which enable all the complex movements needed to perform everyday tasks. To build this type of system capable of the same movements and functions seems near impossible. The robotic hand device coupled together through springs, emulates 16 of these joints. The device is capable of adapting its position so that the fingers are able to grasp an object. With further development, such a device could potentially be applied to a number of tasks which could then be performed by robots not humans.

The ADAPT project was concerned with developing an artificial representational form of what was described as 'presence'. The relationship between the human body and its environment was examined by looking at how this understanding originates from the senses and from past experiences. Additionally mechanisms used by the brain were explored in order to demonstrate this relationship. This was achieved through experiments which characterise 'presence' as it developed in human infants. The way in which artificial systems could be used as



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models to test current theories of perception and action was also explored.

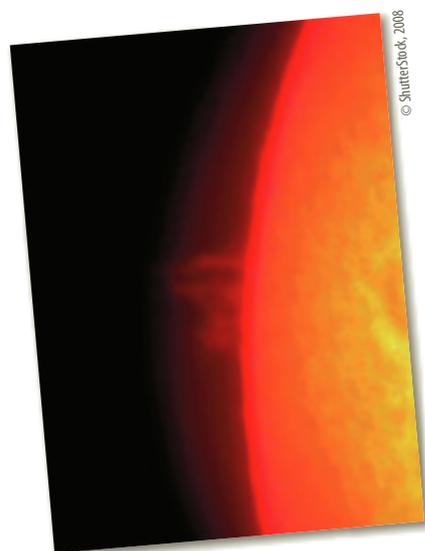
Funded under the FP5 programme IST (User-friendly information society).

Collaboration sought: licence agreement.

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## Improved software for calculating solar irradiance

*The University of Oldenburg in Germany headed a software development project aimed at providing more accurate irradiance calculations in order to better exploit the potential of photovoltaic (PV) technology.*



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PV cells convert sunlight into electricity and represent one of the leading renewable sources of energy today. However, proper estimation of the output of PV cells requires input regarding incident solar radiation, which is often difficult to obtain.

The launch of Meteosat Second Generation (MSG) satellites into Earth's orbit presented an opportunity to improve upon previous methods of calculating the Sun's intensity at the surface. Building on previous research in this field, the University of Oldenburg led four other organisations in a new research project entitled PVSAT-2.

Software was created to calculate direct and diffuse irradiance every hour using a

new scheme developed during Heliosat-3. In addition to satellite data, ground-based measurements were also incorporated to boost accuracy. Application of the kriging of differences technique to the surface data helped significantly reduce the root mean square error (RMSE).

The new software not only increases the accuracy of the irradiance calculations but also improves fault detection. The level of accuracy is also linked to the application's automated performance assessment mechanism. Finally, information about meteorological conditions is used to provide further insight into the quality of the software's output.

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

Collaboration sought: information exchange/training.

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## Creating objectives to enhance learning development

*Interoperable learning objectives have been developed for use in a collaborative learning approach to pedagogy.*

Collaborative learning has become a widely used pedagogical approach. It involves a joint intellectual effort on the part of students and teachers engaging in a common task in which each individual depends on and is accountable to another.

Integrated managed learning environments fall under the collaborative learning umbrella. The Celebrate project has outlined a pedagogy for collaborative learning through the use of interoperable learn-

ing objectives (LOs) which can support e-Learning in school as well as various other sectors. The LOs were designed for dissemination through a demonstration portal in European schools participating in the pilots aimed at assisting teachers in the enhancement of LO development.

Public as well as private sector partners of the project were involved in developing the LOs. A critical mass of standards was created for the LOs applicable to primary as

well as secondary schools. Furthermore, 25 authoring templates were later developed and tested so that teachers and students may create LOs of their own thus expanding the possible resources available to schools. Resources such as images and audio files were also provided in order to assist teachers in developing their own LOs via the authoring templates. These learning assets were made available on the project's demonstration portal.

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

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

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## Personalised learning puts students in a class of their own

*A new learning platform is giving the traditional classroom a radical makeover. Using innovative ICT technology, iClass is putting pupils at the centre of the learning experience and providing them with more control over what they learn.*

Every parent believes their child is unique. And they are right. Every pupil has their own individual strengths and weaknesses, and their own particular way of learning. However, putting this commonsense observation into practice is no mean feat, and our schools have generally not been very successful at personalising the learning experience.

In fact, the image of classrooms as knowledge factories has not changed much since the Industrial Revolution, despite the major advances in teaching methods that have occurred. This model holds that teachers input information, pupils process it, and out comes the learning in neat little packages.

'A school is not a factory', bemoaned British novelist Joseph Lloyd Carr in his acclaimed novel, *The Harpole Report*, which tells the story of a primary school headmaster. 'Its raison d'être is to provide opportunity for experience.'

In recent decades, learning theories have shifted to a student-centred focus, and moved attention away from the teacher, as the imparter of all knowledge and wisdom, towards the pupil or student, while the educator's role has become more that of a mentor and facilitator. However, the standardisation of demanding school curricula and the often large sizes of classrooms make the transition to this more personalised form of learning difficult.

ICT present an opportunity to place the learner at the centre of the learning experience. Traditionally, computers and other information technologies have been treated as subjects in curricula, as word processors or, with the advent of the internet, as powerful research tools for assignments. But ICT are gradually evolving to become

an integral component of the learning experience in general.

The EU-funded iClass project has been working to develop an innovative learning platform based on the concept of self-regulated personalised learning (SRPL) which is designed to empower pupils aged 14 to 18 to take more control of the learning process. Led by Siemens IT Solutions and Services, the project brings together 17 partners from the EU, Israel and Turkey to develop an intelligent cognitive-based open learning system and environment.

'We aim to make education more effective, worthwhile and, above all, enjoyable', explains Eric Meyvis, the project coordinator. 'Pupils are becoming increasingly unmotivated. We are using ICT, the internet and an attractive interface to make learning more fun.'

SRPL boosts a pupil's motivation to learn by personalising the learning process, placing an emphasis on self-direction and self-reliance, and trusting the learner to make mindful and meaningful choices. The model follows three distinct stages: planning, learning and reflecting.

In practice, this means that a teacher creates a learning plan based on a goal to be achieved, suggesting some sub-goals and activities, while some activities can be left open for the student to shape. Students then click on the 'Learn' button to start the assignment. During this process, a system called 'Tips and alerts' provides the pupil with some optional guidance. A personal journal encourages the learner to reflect on their choices and what they have learnt.

Teenagers spend 15 % of their time in a school setting, while adults spend a meagre 3 % in formal education. The upshot of this is the increasing recognition of informal, as well as lifelong, learning as an important aspect of education. The web-based iClass platform is well placed to link seamlessly the formal and informal learning environment.

It has been designed to provide pupils with ubiquitous access to encourage them to exploit formal and informal learning environments to the maximum. In addition, by promoting greater self-reliance and a passion for inquiry among pupils, iClass helps equip them with crucial attitudes for the



emerging knowledge-based economy, which requires people to update and upgrade their skills and knowledge constantly throughout their lives.

At first, the iClass project set itself the ambitious and unrealistic aim of creating an electronic substitute for the teacher. 'We were convinced that the platform could replace teachers, but we soon discovered that this was too technology oriented. We refocused the project to strike more of a balance between technology and pedagogy', recalls Meyvis.

Instead, the platform has evolved to aid the teacher in empowering his or her charges. It also promotes a more open approach to education. However, this departure places new demands on teachers. 'It is a big challenge for schools to switch from traditional learning to iClass methodology, and that is why we have developed a teacher training package. We piloted the training material and teachers were generally enthusiastic about it and the platform', notes Meyvis.

The platform also recognises that the school curriculum in different countries places different demands on teachers, and so has built-in flexibility to allow the system to be customised. 'We have created a versatile infrastructure and it will be up to developers to take the next step and customise the platform for individual countries', says Meyvis.

A leading German publisher is already developing content for the German market and opportunities abound for developers in other countries to tailor the system to other national markets.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90131>



## Peer-to-peer networking takes internet out of the equation

*When people working on a project get together with their laptops and PDAs, they share information via the internet and a client server. But new software developed by European researchers allows independent, ad hoc, secure networking anywhere.*

The power and reach of the internet in today's world is such that people have, in a short space of time, become over-reliant on it for many tasks both in business and personal life. If a group of people are gathered together with their laptops in a conference room and working together on a project, they need to use the web as a communications medium and a central server to store the data they are working on.

If the internet connection is unavailable, congested or even just unaffordable, it has a serious impact on the productivity of the group. To overcome this, there must be a move away from the centralised, rigid client-server paradigm and fixed communications infrastructure. This is just what researchers on the EU-funded Popeye project have been doing.

The researchers realised that when a group of people gather for a business meeting, be it on the sidelines of a conference, or in airports or hotels, they all carry laptops or PDAs which have vast processing power. They also have the built-in ability to wirelessly network, although this is usually used to connect to the internet.

'We decided you could use the combined computing power of whatever portable devices are present to conduct meetings in a productive manner,' says project coordinator Nicolas Berthet. Apart from the advantages of being able to collaborate in any environment without the need for the usual fixed infrastructure, using just the portable personal devices of the people present has other advantages.

'Even if you do have access to the internet, that can often be a distraction if a group are gathered together to work on a project. While one person is doing his presentation, or providing his input, others could be checking their email or performing other tasks while waiting their turn, instead of concentrating on the task at hand,' he says. 'But using peer-to-peer networking allows everybody to focus,' he says.

The researchers have taken advantage of the technology embedded into today's portable computing devices by developing new software which is able to cope with different hardware standards. A variety of devices can seamlessly slot into a spontaneously created network. 'It doesn't matter if there are different brands of Wi-Fi cards or laptops, if they have a small amount of storage space and small screens, or plenty of memory and a big screen, the Popeye system can bring them all together,' he says.

The software creates a shared repository which everybody in the network can tap into, moving documents and other files to and from their individual hard drives. Because the resources of all the devices are being shared to create the repository, somebody with a small PDA will get exactly the same access to the material as somebody with a powerful laptop.

'Using peer-to-peer in this way means there is no particular node or site where everything is stored for reference,' Berthet says. 'You don't get to download files as such, but to open any file or access any data in the shared space and use it. There is a common repository that only exists because the community exists, and it ceases to exist when the community ceases to exist.'

Even though there is no centralised control or storage point, people can opt in and out of the network without any adverse effect, as it automatically re-



adapts. This even applies to the person who created the network in the first place or the network manager, if there is one.

How does it work in practical terms? First, you would have to install Popeye via online download, CD, memory stick, or at the conference itself, via an infrared port or bluetooth. The researchers have included many of the applications available with standard online collaborative systems in Popeye, including polling, instant messaging, notice boards, file sharing, screen sharing, collaborative maps and even an anagram game.

Everything is open source, so anybody can develop their own applications to run on Popeye. According to Berthet, more bandwidth-hungry functions, such as video streaming, may be the subject of future research.

While the initial focus of the project was to allow people to work on collaborative projects using personal IT devices independent of the internet, the applications of Popeye go beyond business meetings and the need for corporate infrastructural support.

'In a disaster situation, it can take days or weeks to get power and communications restored, and Popeye could help emergency services and relief workers to share information,' Berthet offers as an example. 'In the EU, where the ultimate aim is a laptop for every child, the potential for small interest groups and neighbourhood groups to network is enormous.'

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/id/90065>



## Simulation software reduces physical testing

*New software for computational simulations provides engineers with the means to realistically predict, at a very early stage in the design process, an automobile part's projected performance. It also reduces the need for physical testing.*

The increasing interest in substituting steel parts in automobiles with lightweight materials is accompanied by an increasing demand for innovative forming strategies. Deep drawing combined with an integrated electromagnetic calibration step is among the most promising technology currently available for extending the forming limits of aluminium alloys.

Electromagnetic forming (EMF) is an innovative high-speed forming process using the energy of pulsed magnetic fields to apply forces to materials of high electrical conductivity while increasing their formability. Aiming to exploit the full potential of this technology in industrial production of automotive parts, EMF project

partners investigated different aspects of its applicability with the use of numerical models.

ESI Group contributed significantly to the aims of EMF project by developing suitable options within the electromagnetic code Symbagna and the manufacturing simulation application PAM-STAMP. Primary emphasis was placed on all relevant physical phenomena, which govern the electromagnetic forming process, through their numerical representation.

The accuracy of process simulations was significantly improved by considering the effects of the workpiece heating and deformation, as well as the electrical circuit parameters of the EMF charging machine. More specifically, by using the trusted PAM-STAMP code for simulating the sheet metal forming process, the performance of a wide range of die designs could be quickly evaluated.

A finite element formulation of electromagnetic phenomena governed by the four Maxwell equations was provided by the Symbagna code modules. Transient phenomena involved in the electromagnetic forming process were introduced to the complete coupled electromagnetic-mechanic model.

The comprehensive software suite proposed by the EMF project aims to meet the requirements of automotive designers for a fully realistic analysis of electromagnetic susceptibility problems during the EMF process.

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

Collaboration sought: further research or development support.

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## Putting child passenger safety first

*The importance of vehicle safety and the minimisation of injury in the case of an accident are not to be underestimated. There is a lot of research on how to improve upon adult passenger safety, yet there has not been as much research conducted on child passenger safety.*

Vehicle safety is essential to the minimisation of accidents, injuries and in all too many cases the prevention of the loss of human life. Since the invention of the motorised vehicle this has been a priority issue. For this reason we have seen the creation of many organisations which have the sole purpose of pushing forward the agenda for better vehicle safety standards. As early as 1958 the United Nations (UN) established the World Forum for the Harmonisation of Vehicle Regulations. Many non-governmental organisations (NGOs) and politicians have since campaigned for better regulations and the industry has followed by incorporating better safety standards in vehicle design, such as the inclusion of airbags as a standard feature.

It is therefore surprising that child safety regulations have taken the backseat to that of

adult safety. There has been a lot of research conducted to advance the means for adult safety in the vehicle, yet little knowledge is available on methods to improve upon child vehicle safety.

The CHILD research project set specific objectives which redress the balance. Its main objective was to develop injury criteria for different body regions on the child. Real-life accident reconstructions were performed in crash test laboratories. The physical parameters were identified in front and side impact conditions. Out of these results the thresholds for injury were defined and injury risk curves constructed.

The data can be seen as essential for the development of new test procedures which can be used to evaluate the level of protection offered by child restraint systems.



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

Collaboration sought: information exchange/training.

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## Photonics for nano-applications

*Sensing operations invariably exploit highly specific technologies to address particular measurement applications. Nanostructured photonic materials promise to open up an entirely new range of application prospects particularly those related to addressing small-scale samples while enhancing the sensor system's stability.*

With the increasing demand for highly integrated sensitive detectors for biomedical and environmental applications, the many promising optical properties of nanostructured photonic materials were explored within the Nanophos project. Aiming beyond the established gas sensor concepts, both their linear and non-linear optical responses when introduced into chemical environments were investigated.

The project partner efforts have been directed towards the development of sensor devices which register changes in the optical properties of gas sensing materials

such as metal oxides and polymers. Based on the testing results, a non-contact remote sensor was designed and developed that enables the realisation of point sensing at room temperature.

The sensor's head comprised a thin film of the active sensing medium with a suitable diffractive interface and a retro-reflective element. The interrogation system developed at the laboratories of the National Hellenic Research Foundation included an optical transmitter with a laser source of tuneable wavelength and adjustable power. Laser beam expanders and collimators

enhanced the quality of the final focused spot. Furthermore, a reference arm was incorporated to prevent potential laser instabilities and provide the control required for the efficient target detection.

Currently available gas sensor technologies have resulted in a multitude of operational standards that fail to consistently cover actual industrial and environmental needs. New photonic sensor device introduced within the Nanophos project will enable highly selective detection of a wide range of gaseous chemical agents, such as  $O_x$ ,  $NO_x$ , CO,  $SO_x$  and other pollutants.

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

Collaboration sought: further research or development support; joint venture agreement; financial support; venture capital/spin-off funding.

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## Nanotechnology for the sensor industry

*Nanotechnology has provided new impetus to a number of disciplines including research into the gas sensing field. Modern-day capabilities to detect toxic gases are indeed likely to be improved through the development of nanostructured media and related devices.*

The EU-funded Nanophos project aimed to overcome the shortcomings of the currently available sensor products and at the same time move away from the principles that govern them. In other words, the project partners were no longer concentrating on electrochemical, spectroscopic gas sensor concepts or those based on conductivity.

Project partners at the National Hellenic Research Foundation developed an integrated photonic free-space point sensor sys-

tem. The system, which is based on the use of light beams, can monitor both physical and chemical parameters through a sensor element. The sensor element can be placed at any remote point, remaining optically linked to the base station.

The device comprises an optics- and electronics-based platform, a sensor head and a receiver. The innovative aspect of this approach lies in the fact that a number of parameters can be monitored at the same

time, resulting in extended sensory networks when there can be many remote points on a frame.

The applications of this sensor system vary and its advantages are its low cost and its multisensor profile. Furthermore, remote operation is aided through the use of special atmosphere compensating optics and methods.

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

Collaboration sought: further research or development support; joint venture agreement; licence agreement; financial support; venture capital/spin-off funding.

<http://cordis.europa.eu/marketplace> > search > offers > 4303

## Photosensitisers enhance singlet oxygen production

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

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

Work led by the Universidad Complutense de Madrid examined the effectiveness of various photosensitisers, substances that enhance singlet oxygen formation via photocatalysis. Specifically, a number of polyazaheterocy-

clenic ruthenium (Ru) compounds were tested on samples containing high concentrations of two well known bacteria: *Escherichia coli* (*E. coli*) and *Enterococcus faecalis*.

The experiments revealed that none of the Ru complexes were effective in the absence of light. On the other hand, bacterial concentrations started dipping when radiation in the visible spectrum was introduced. Furthermore, when the tests were performed in the homogeneous phase, the cationic RDP2+ photosensitiser dramatically

reduced the amount of *E. coli* by two orders of magnitude.

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

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

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4581

## Achieving Miracles in urban transport

*Cork City Council in Ireland is looking to share the valuable lessons it learned during its attempt to convert its vehicle fleet from conventional diesel to biofuel.*

The European Commission has dedicated considerable funding to promoting safe, environmentally-friendly transport in urban centres. A prime example is Miracles,



a project aiming to explore alternative methods of transport and to promote best practice across Europe.

The city of Cork was selected as one of the Miracles test cities. Seventeen of its municipal vehicles were converted from diesel to pure plant oil (PPO). Measurements made by the University of Limerick revealed significant gains in engine performance while pollutant emissions remained unchanged.

Once on the road, initial problems with black smoke, noise and odours were resolved by introducing 25 % diesel into the fuel mix and by preheating the PPO prior to combustion. Also, a new valve was developed to decrease the amount of time required for refuelling. A second phase involved running other vehicles on locally-produced biodiesel, Gro-oil, which did not require engine modifications.

Further to their experience in the Miracles project, the Cork City Council traffic engineers arrived at a number of recommendations. For example, conversion kits must be tailored to the type of vehicle and not all vehicles can be converted. Driver feedback is an essential component in the success of such projects and should be encouraged. Finally, establishing biofuel standards and building refuelling infrastructure will greatly facilitate the adoption of biofuels.

In addition to environmental benefits, economic benefits for the local economy were also demonstrated. Cork City Council is communicating its positive experience to urban centres across Europe, starting with the other Miracles cities: Barcelona, Rome and Winchester.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4414

## Imaging tools for micromechanical fibres

*The vast amount of composite products available is staggering and the majority of these are based on plastic. In an effort to reduce the dependency on plastics and the environmental burden they produce, natural fibre composites have become of greater interest.*

It is of major importance to the food packaging industry that studies are undertaken into the performance of new technologies. One such study investigated the micromechanical structure in short natural fibre composites and the means by which they can be best validated. However, a case in point, in order to monitor and test material performance, suitable quantification methods have to be developed.

The Biocompac project investigated several methods for quantification but many failed because of the limited length of the fibres and also because of the variance between fibre strength and matrix strength. Image analysis techniques such as ion scattering spectrometry (ISS) or secondary ion mass spectrometry (SIMS) are helpful in determining surface characteristics of fibre orientation.

It is known that the orientation of fibres as well as the presence of agglomerates affects the tensile tests. Therefore, it was necessary to develop methodologies that could serve as quality control tools. It was concluded that the development of imaging tools would result in a highly effective analysis tool, one that could be used for natural fibre composites.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4371

## Advancing biosensor research

*Under the auspices of the Nanomass project, a new measurement system was realised for characterisation of miniature sensor devices.*

The combination of complementary metal oxide semiconductor (CMOS) technology with innovative nanotechnology processes and techniques was the primary focus of the Nanomass project. By exploiting novel nanolithography methods, innovative technology was generated on the basis of an array of silicon cantilevers on the nanometre scale. Researchers aimed to realise extremely compact and ultra-sensitive mechanical mass sensors for bio-, chemical and environmental applications.

Once the prototypes were developed, they underwent functional evaluation testing in

a controlled ambient chamber. A measurement setup was built that allows characterisation of micro-/nano- electro-mechanical system (MEMS/NEMS) devices. The specific gas chamber operates under a wide range of pressure and temperature control as well as gas composition and state conditions. The system's features allow functionalisation of fragile devices, such as NEMS and offer reliable characterisation of extremely complex biosensor applications.

The system was employed to run several functionality tests in order to demonstrate the performance of each of the fab-

ricated cantilevers. Tests resulted in the determination of cantilever mass sensor stability under air and vacuum operation conditions. The minimal mass sensitivity that was demonstrated was of the order of an attogram, that is 10<sup>-18</sup> gram. The growing interest received from the bio-research community paves the way for the system's commercialisation. For further information on the project, please visit: [http://einstein.uab.es/\\_c\\_nanomass](http://einstein.uab.es/_c_nanomass)

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 3936

## Reducing the pollutant emissions from gas turbines

*Numerical models of the combustion system of a gas turbine have been improved within the Muscles project to help the design of aircraft engines for reduced impact on the atmosphere.*

A major challenge for gas turbine engineers has been the development of liquid-fuelled combustion systems that will meet stringent emissions standards without sacrificing operability. Recent developments have resulted in combustion systems which do produce low levels of unwanted chemical emissions, including lower nitrogen oxides ( $\text{NO}_x$ ) emissions, but all were prone to damaging unsteady combustion.

This issue has been addressed within the Muscles project by providing a thorough foundation for the theoretical modelling of the self-excited oscillations inside the combustion chamber. Leading to such intense pressure fluctuations that may even result in structural damage, enhanced heat transfer is also a source of sound waves. The inlet conditions of the fuel and air mixture are perturbed by sound waves which then aggravate the unsteady combustion.

The main objective of project partners at the University of Rouen was to investigate the direct effect of pressure fluctuations on the vaporisation of the incoming fuel spray. For this purpose, a non-linear theoretical approach was adopted, where non-linearity took the form of saturation in the flame's

response. Essentially, the latter occurs as pressure fluctuations become so intense that the fuel/air flow reverses while the heat release is still enhanced.

Direct numerical simulations (DNS) of pressure waves injected towards a cluster of droplets were first performed for a layered flow, and then homogeneous turbulence was included in the numerical model. The results, together with new models based on either Reynolds-averaged Navier-Stokes (RANS) calculations or large eddy simulations (LESs), were validated against ex-

perimental data from the EM2C laboratory. Experiments were conducted using a highly controllable configuration in which acoustic waves generated by a driver unit placed at the bottom of the fuel burner interacted with turbulent spray flame.

The final models will be synthesised into a comprehensive model, which will be able to predict the frequency and more importantly, the amplitude of pressure fluctuations. In the near future, the design of combustion systems could be tried out and adjusted to deliver not only low emissions, but also steady combustion.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4388



## Bringing down internal combustion engine emissions

*With increasing concerns about the harmful effects of pollutant emissions, engineers aim to exploit the full potential of internal combustion (IC) engines to meet stringent environmental regulations.*

Over the years, computational fluid dynamics (CFD) has become an established tool for the design and optimisation of internal combustion engines. Advanced numerical models have proven their value in drawing up a detailed description of ignition timing and heat release required to capture the pathways of nitrogen oxide ( $\text{NO}_x$ ) formation.

This numerical approach was particularly attractive for the industrial partners of the Minnox project, the benefit of which would have been a drastically reduced need for time-consuming experimental research. Major names in the European automotive industry joined their expertise to develop an advanced model that accounts for all important physical processes occurring in IC engine cylinders.

In commercial software packages for CFD simulations, turbulence models are based on a number of assumptions and therefore are effective for certain types of flows. However, resolving the turbulence effects close to the walls of the IC engine is of crucial importance for accurately predicting the characteristics of a wall-bound turbulent flow.

Research work at the laboratories of DaimlerChrysler AG in Germany aimed to improve the KIVA-3 and STAR-CD computer programmes for numerical calculations of 3D chemically reactive fluid flows. More specifically, a unified and generalised treatment of wall boundary conditions was introduced to achieve a higher level of accuracy in wall friction predictions.

Without extremely dense computational grids and excessive computational resources usually required, Reynolds-averaged Navier-Stokes (RANS) calculations and large eddy simulations (LENS) could be extended up to the cylinder wall. Promising high flexibility along with simplified computations, the KIVA-3 and STAR-CD code, implementing the proposed method, have been used for simulating steady and pulsating fluid flows in a one-cylinder engine.

Computations under a wide range of operating conditions were all in good agreement with direct numerical simulations (DNS) as well as with data collected at the experimental setup developed during the course 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 > 4405

## Studying corrugated samples at the sub-micron scale

*A protocol was developed for characterising the friction and wear of coatings at the sub-micron scale. The protocol enabled corrugated samples to be accurately quantified.*

Vacuum coatings result in reduced wear, and in some cases enable lighter materials to be used. These nanostructured coatings, which combine high hardness with high toughness, have contributed to the improved quality of automobile parts. The Nanocoat project used an atomic force microscope (AFM) to study the properties of the coatings at the sub-micrometre scale. A protocol was written for characterising friction properties of

corrugated surfaces, which comprise alternating parallel ridges and grooves. They also represent the greatest challenge when measuring coatings.

The first part of the protocol described how the AFM was used to simultaneously acquire the topographic and friction maps of surfaces. The topographic map was used to calculate the tilt of the sample's surface.

The second part of the protocol concerned the application of the topographic correction to experimental data.

Researchers noted that the friction behaviour of coatings was not uniform at the micron scale. This may be as a result of the non-homogenous chemical composition of the coating at the sub-micron scale. A second possibility was that it could also be due to the presence of contaminants on the coating's surface.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4337

## Improving emissions of heavy-duty diesel engines

*European researchers have investigated ultra-low nitrogen oxide (NO<sub>x</sub>) and particulates emissions for trucks and bus diesel engines, which would meet Euro 5 emission limits. Their study concerned the application of a new combustion process to future heavy-duty engines.*

The process, known as homogeneous charge compression ignition (HCCI) involves both conventional spark ignition and diesel compression ignition technology. Combining the two systems allows diesel-like efficiency without NO<sub>x</sub> and particulate matter emissions.

To put it simply, fuel is thoroughly mixed with air in the combustion chamber giving a very high proportion of air to fuel. When the engine's pistons reach the highest point of the compression stroke the air/fuel mixture ignites. This is achieved from compression heat, like in a diesel engine, and does not require the assistance of a spark plug. The result is low fuel usage and low emissions.

Researchers from the Hy-space project applied HCCI technology to a multi-cylinder

diesel engine. For the purpose of testing, the engine was converted from a unit injector to a common rail injector system. This allowed very high gas recirculation rates to be realised. With this engine, higher brake mean effective pressures of up to 10 bar could be achieved. However, above this level both fuel consumption and emission values increased.

This meant that any application of the HCCI combustion system would only be feasible in a dual mode form. Therefore, at low loads homogeneous combustion should be used, while large and full loads should employ conventional heterogeneous combustion. Under these circumstances, expensive exhaust gas after-treatment is still required, resulting in a substantial increase in engine cost.



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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4412

## Optical-based transducers

*The field of sensor technologies has been renewed with the application of nanotechnology principles. Innovative approaches are revolutionising the area and increasing the scope of sensitivity of sensor media.*

The EU-funded Nanophos project combined partner expertise in order to overcome deficiencies of currently available sensor products. The key aim was to design media that could react and produce an optical response based on synthetic photonic nanocomposites. This new class of purely optical chemical sensor devices would carry advanced characteristics and increased sensitivity.

Within the scope of this project, partner Weizmann Institute of Science, based in Israel, focused on the potential of evaporated gold (Au) island films as transducers. The aim was to evaluate the use of advanced materials with unique property profiles in order to achieve the project goals.

Gold island films have been used in a variety of sensor application studies and the

aim within the Nanophos framework was to develop optimised transducers based on this technology. Using evaporation, ultra-thin films were prepared and studied using atomic force microscopy (AFM) and high-resolution scanning electron microscopy (HR-SEM). Further studies are warranted on the use of this technology as transducers for the sensor industry.

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 > 4320

## Nanocomposites for a new type of coating

*While current applications of powder metallurgy are well established, researchers in the field continue to develop novel processing methods that promise significant savings in time and materials, and therefore cost.*

A significant challenge for the automotive sector is the fabrication of complex-shaped parts without defects which increase the risk of failure, but with high reliability at a lower cost. Powder metallurgy was explored within the European project PM-MACH as a possible processing route to reduce machining costs. To optimise the near-net shaping of engineering parts were made out of a mixture of metal powder. The minimisation of fabrication time was also considered as a primary competitive factor.

In powder metallurgy, a mixture of metal powders along with suitable organic lubricants is first compacted by placing it under pressure in

the die which defines the desirable shape. The compact powder is then heated in a protective atmosphere at a temperature below its melting point, so that powder particles weld together. Sintering ensures sufficient strength to the parts for their intended use, which however demands further careful and costly machining. Project partner, Platit AG in Switzerland focused on developing nanocomposite coatings offering heat and scratch resistance during green machining of the engine part.

To tailor the coating's properties to its function, researchers at the Platit AG laboratories took standard physical vapour deposition

(PVD) technologies one step further. By depositing very different kinds of materials, components like chromium (Cr) and aluminium (Al) with silicon (Si) are not mixed completely. The nanocrystalline chromium aluminum nitride (CrAlN) grains were therefore embedded in an amorphous matrix of silicon nitride (SiN<sub>x</sub>). Thanks to a higher hardness as well as friction resistance, coatings with a nanocomposite structure proved to be able to stand their ground even against thick chemical vapour deposition coatings.

These coatings have been made available for industrial use in forming applications with the trademark nACVIc®.

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

Collaboration sought: manufacturing agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4390

## Nanophotonics for sensing applications

*The multitude of available sensor technologies has resulted in operational standards that fail to consistently cover long-standing industrial needs. In this context, the performance constraints of a new class of gas sensing devices that exploit emerging nanophotonics technologies have been explored within the Nanophos project.*

Recent technological advances have provided fabrication routes and strategies to design and assess sensor elements with dimensions of a few nanometres and unique capabilities. Research work conducted within the framework of the Nanophos project has revealed the tremendous potential of nanostructured materials for advanced gas sensing applications.

Nanophos project partners aimed beyond the established electrochemical or spectroscopic gas sensor concepts. Their concerted efforts covered development of nanostructured ma-

terials, capable of altering their optical properties in the presence of selected gaseous pollutants, as well as sensor designs for the detection of environmental emissions.

Project partner, 3D Digital Design & Development Ltd was charged with the provision of an integrated test platform to investigate the electrical characteristics of the newly developed sensors. In accordance with the free-space Young interferometer or planar optical waveguide configuration of the sensor under trial, a software programme allowed the configuration of full lifecycle tests.

Furthermore, a sophisticated gas control system was necessary for physically separating sensing elements from gas chemical agents, as well as for controlling the flow of the latter into the test chamber. The Photonics Media Laboratory at the National Hellenic Research Foundation was equipped with all the essential testing facilities for confirming the sensors' performance under different operating conditions within industrial settings.

The achievements of the Nanophos project are expected to establish a roadmap for nanotechnologies in industrial sensing applications.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4452

## Realising the full potential of powder metallurgy

*Engineers with Element Six Ltd in Ireland have developed new, stronger tools that can withstand the rigours of machining powder metallurgy (PM) composites.*

The Growth programme was dedicated to promoting innovation in European industry and the PM-MACH project was no exception. The objective set by the PM-MACH consortium was to reduce manufacturing costs for components with complex geometry using PM.

The financial benefits of PM are well established, but problems remain regarding the machining phase. Element Six Ltd, a materials specialist participating in PM-MACH, investigated several new concepts

for machine tool materials for green PM applications.

First, in collaboration with the Technical University of Berlin, Element Six produced new cutting tool edge geometries that significantly reduce the occurrence of surface breakouts. Next, the extreme hardness of polycrystalline cubic boron nitride (PCBN) was exploited to construct drill bits for green PM materials. This led to further improvements in the surface quality of the finished product, including fewer edge breakouts.

Finally, Element Six and its PM-MACH partners experimented with soft magnetic composite (SMC) PM materials to determine whether tool wear characteristics could be improved. They identified one effective SMC material and also proposed the selective use of SMC additives to instil increased machinability.

The PM-MACH results will aid not only PM but also other machining applications.

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

Collaboration sought: joint venture agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4413

## Developing a biosensor for odorant screening

*To transfer and immobilise olfactory receptors on biosensors, small lipidic nanosomes from plasmic membrane fractions of yeast cells have been prepared and characterised within the Spot-nosed project.*

Due to their significant advantages, including robustness, portability and low manufacturing costs, biosensors are considered to be promising alternatives to conventional analytical devices. Recent advances in biotechnology and nanotechnology have opened a new way to elaborate biosensors that mimic the olfactory system of mammals with numerous potential applications. In industrial settings electronic noses, comprising an array of electro-chemical sensors capable of recognising simple or more complex odours, could contribute to both process and quality control.

Within the European Spot-nosed project, the possibility to develop the first nanobiosensor array, based on the electrical properties of single olfactory receptors was explored. A layer of proteins that constitute the olfactory receptors in animal noses was, for this purpose, placed on a nano-electrode and the reaction when proteins were in contact with different odours was measured. The new biosensor would offer the ability to detect odorants at concentrations that would be imperceptible to humans.

Several hundreds of different proteins, which the Spot-nosed researchers genetically copied from animals and grew in yeast, were needed for the electronic nose to detect any smell. Different proteins would react to different odorants and it is the resultant combination of reactions that identified a certain smell. Localisation of the olfactory receptor 17 expressed in yeast was performed by means of confocal and electron microscopy, revealing the presence of the receptor at the plasma membrane. Yeast cells were then mechanically disrupted and the plasma membrane fractions were separated from unbroken cells and cell walls by successive centrifugation steps.

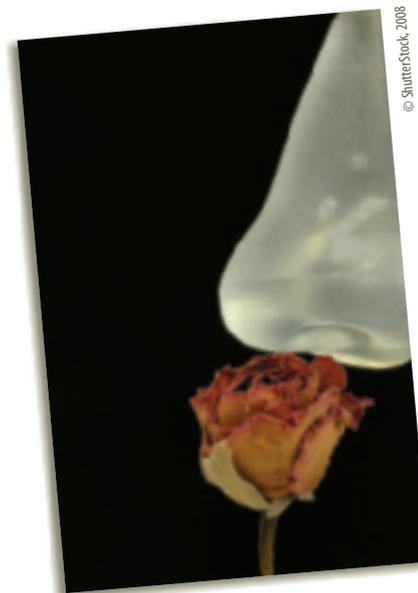
Inspection by transmission electron microscopy (TEM) of negatively stained membrane fractions indicated that they are composed of circularised nanosomes or unclosed fragments with sizes ranging from 40 to 500 nm. Their size was further homogenised to 40 to 60 nm by additional sonication. To obtain a 3D description of the adsorbed nanosomes, membrane fractions were deposited on bare and functionalised

gold substrates and imaged with atomic force microscopy (AFM). Although the aspect ratio of the nanosomes adsorbed is far from unity, this type of nanosomes incorporating olfactory receptors were found to still contain some aqueous solution inside.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 3998



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## Mass-sensing nano-cantilevers on a chip

*As miniaturisation of cantilever dimensions increases both the mass and spatial resolution of resonating cantilever-based mass sensors, a dedicated fabrication method for nanometre-sized cantilevers has been introduced.*

Mass detection is based on monitoring the resonant frequency shift when nanometre-sized particles are deposited on cantilevers, electronically excited by an electrode located at submillimetre distance. However, the magnitude of the current to be detected

is proportional to the coupling capacitance between the cantilever and the driver.

To eliminate the parasitic capacitance introduced by external bonding pads and wires, silicon cantilevers resonators were monolithically integrated with complementary metal oxide semiconductor (CMOS) signal conditioning circuits. In particular, the 'Nanomass II' project has developed the methodology to combine standard CMOS technology with nanofabrication techniques of resonant cantilevers.

More specifically, at the laboratories of the Technical University of Denmark, nano-cantilevers were integrated with CMOS circuitry by post-processing a CMOS chip. Local openings were created in the top passivation layer of the CMOS and the upper poly-silicon layer was etched down to the 100 nm thin thermal oxide.

The next step was to deposit a thin aluminium (Al) layer on the oxide, which

was then used as an etch mask to transfer the cantilever structure to the lower poly-silicon layer of the CMOS. To define the cantilever pattern, low-energy electron beam lithography was combined with direct-write laser lithography (DWL), which could lead to significant reductions in the fabrication costs.

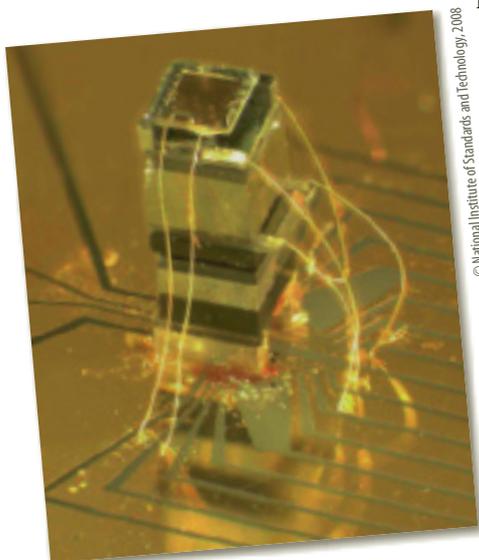
Before releasing the cantilever in buffered hydrofluoric acid (BHF), a supportive photoresist coating was applied and an opening was created over the fabricated structures to eliminate static friction. The cantilevers with dimensions approaching the grain size of the poly-silicon are finally dry-released after oxygen plasma ashing.

Optimisation of the poly-silicon grain size was attempted by the 'Nanomass II' project partners, but it was not possible to improve the structure further due to CMOS processing limitations. Further miniaturisation will be based on alternative materials for the cantilever, such as amorphous metals or single crystal silicon.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 3769



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## Control of noise in industrial settings

*An efficient strategy for controlling the sources and routes of noise transmission has been introduced to improve the efficiency of current solutions based on modifications of industrial machinery.*

Noise pollution from modern industrial activities has been identified as an environmental problem of growing importance. Especially within machine halls, noise levels often exceed the legal regulations for employee exposure to noise. Aiming to assist the industrial sector in adapting to increasingly more restrictive European environmental regulations, the Noiseless project partners have developed innovative tools for controlling the sources of noise.

Sound generated by vibrations of machines' mechanical parts could be minimised through the intervention of sensors and actuators. Project partners at the Catholic University of Leuven focused on improving the efficiency of an active structural acoustic

control system that depends on the location of selected sensors. After the identification of the most suitable control configuration, the next step in the system's design was to implement an efficient processor of the sensor information sending control signals to the actuators.

The approach adopted for the control algorithm was motivated by the idea that it should be possible to improve the performance of the system that repetitively executes the same task. Modifications to the input signal applied by an iterative learning algorithm during the operation of the system lead the enhancement of its future performance. The active control strategy, which can be a solution for restrictions of passive methods such as enclosures and sound



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absorbing materials, has been successfully validated on a laboratory model of a punching machine.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4325

## Design of a newborn child dummy

*A newborn child dummy has been designed for use in accident reconstructions, presenting a novel approach for testing infants' vehicle occupant safety.*

A large amount of research had been conducted on the safety of adult vehicle occupants; however, the same was not true regarding children. Using prior research from a previous project, the CHILD project focused on ways to increase knowledge about children's vehicle occupant safety. More specifically, the project found ways to implement this information in child restraint design appli-

cations, evaluation testing and regulation. What resulted was a highly worthy source of realistic worldwide crash injury information which was compiled within the framework of child restraint testing and regulations.

In the project's initial stages, a newborn dummy was not in existence for use in accident reconstructions. TNO, the Netherlands organisation

for applied scientific research, developed the Q0-dummy which represents a newborn child. The dummy weighs 3.4 kg and has achieved the biofidelity requirements for head and neck, the two most vulnerable body parts of a newborn in a car. The dummy was proven durable in a test program and three prototypes were planned.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4462

## Ageing process for new insight into batteries

*The development of battery-driven automobiles requires a greater understanding of the lithium batteries involved. It is vital therefore that performance over time issues are understood in an effort to further optimise this promising technology.*

Developing ageing techniques therefore became part of the testing procedure requirements. Liberal, an EU-funded

project, sought to develop systematic ageing techniques that would prematurely age lithium batteries in a manner that would



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mimic real-time ageing and be suitable for electrochemical impedance spectroscopy (EIS) testing. EIS evaluates the electrochemical properties of the battery and as such is ideal for assessing its ageing processes.

The goal of the project was to realise a testing methodology that could

predict the full 10-year (or longer) lifespan of a battery. In doing so, it will need to assess such factors as battery performance in vehicles, firstly on a theoretical basis and then on criteria related to aging and stress mechanisms. Studying battery degradation and performance when the vehicle was stationary was also incorporated into the trials.

It is hoped that the age-acceleration process will go a long way in assisting European developers in improving lithium battery technology both for the transport and other related industries. With the information generated from these tests, designers have a valuable tool from which they can draw insight into battery performance over time.

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 > 4456

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

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

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

### Conference on the Arctic

*The 'Arctic frontiers 2009' conference will be held from 18 to 23 January 2009 in Tromsø, Norway.*

The event will comprise an opening (18 January), policy conference (19 and 20 January) and a scientific conference (21 to 23 January). Under the title 'The age of the Arctic', the policy part will be dedicated to the increasing human focus on, exploitation of and conflicts in the Arctic vis-à-vis politics, economics and the environment.

The scientific agenda, on the other hand, will focus primarily on the structure and biogeochemical cycling of Arctic marine ecosystems in a period of rapid climate changes. Furthermore, it will address issues of sustainable management of Arctic regions.

*For further information, please visit:*  
<http://www.arctic-frontiers.com>

### Conference on the integration of ICT research efforts

*A conference on the strengthening of research efforts in the integration of information and communication technologies (ICT) will take place in Budapest, Hungary, on 19 and 20 January 2009.*

A variety of pedagogical and andragogical (i.e. adult learning) concepts support individual learning processes in different stages of the human lifetime. This conference aims to explore innovative solutions for individual learning processes, focusing on the learner-technology relationship.

Topics will include some of the following:

- policy environment: new vision of e-learning;
- personalised learning environments;
- institutional development and technologies;
- virtual mobility;
- data mining and software ergonomics.

The conference is organised by the EU-funded 'Knowledge-on-demand for ubiquitous learning' (LOGOS) project, the project coordinator Antenna Hungaria and the European Distance and E-Learning

Network (EDEN). It marks the completion of LOGOS.

*For further information, please visit:*  
<http://www.logosproject.com/Default.aspx?tabid=666>

### Workshop on silicon on insulator technology

*The fifth workshop of the 'Thematic network on silicon on insulator technology, devices and circuits' (Eurosoi 2009) will take place from 19 to 21 January 2009 in Gothenburg, Sweden.*

The event is an international forum to promote interaction and exchanges between research groups and industrial partners involved in silicon on insulator (SOI) activities all over the world.

Eurosoi 2009 will be held at the Chalmers University of Technology and will include oral and poster sessions, keynote presentations, a tutorial and ample room for informal discussions.

The agenda covers recent progress in SOI technologies and will be of interest to materials and device scientists, as well as to process, circuits and applications-oriented engineers. Typical topics include:

- the synthesis of advanced SOI wafers;
- materials evaluation, properties of ultra-thin films and buried oxides, defects and stress, interface quality;
- SOI metal-oxide-semiconductor field-effect transistors (MOSFETs): characterisation, modelling and simulation of typical mechanisms, parameter extraction, reliability issues;
- high-performance complementary metal-oxide-semiconductors (CMOS) and bipolar devices: low power/voltage and radio frequency (RF) circuits, memories, sensors and microelectromechanical systems (MEMS);
- innovative devices: multiple-gates, tunnelling transistors.

The event is partly sponsored by the EU-funded Nanosil network of excellence (NoE).

*For further information, please visit:*  
<http://chalmers2009.eurosoi.org>

### Symposium on allergic and autoimmune diseases

*The final symposium of the EU-funded Forallvent project will be held on 22 January 2009 in Wrocław, Poland.*

The event will bring together an interdisciplinary group of European experts to summarise their most important findings in the field of allergic and autoimmune diseases. Particular emphasis will be placed on the potential applicability of the results in the prevention and treatment of these diseases. This will allow an overall appraisal and a comprehensive synopsis of past and ongoing findings in the European research area (ERA).

Colleagues from international cooperation (INCO) target countries will be invited to discuss the potential impact of the findings for their countries.

*For further information, please visit:*  
<http://www.forallvent.info/about-us/achievements/final-symposium-wroclaw>

### Conference on ICT contributions to a global sustainable future

*An international conference entitled 'ICT for a global sustainable future' and dedicated to the question of how information and communication technologies (ICT) can durably contribute to the well-being of all citizens around the world will be held in Brussels, Belgium, on 22 and 23 January 2009.*

Organised with the support of the EU-funded Paradiso project, the conference is motivated by the belief that ICT will play a central role in achieving truly sustainable development, more sustainable economic growth, more equally shared resources and ultimately the well-being of all citizens of the world. The conference will cover discussions on what is at stake and which ICT research areas have to be explored.

*For further information, please visit:*  
<http://www.paradiso-fp7.eu/conference.php>

## Workshop on the Genesys platform

*The EU-funded research project 'Generic embedded system platform' (Genesys) is organising a workshop entitled 'Genesys – an architecture candidate for Artemis' on 4 February 2009 in Munich, Germany.*

This workshop will present the style of embedded architectures and architectural services developed in the course of Genesys. This style is based on the seven requirements of the 'European technology platform on embedded systems' (Artemis): composability, networking, security, robustness, diagnosis, integrated resource management and evolvability.

The scope of the workshop is the introduction of cross-domain solutions for the automotive, industrial control, avionics, mobile systems and consumer electronics sectors. Participants will find out about an architecture that facilitates the reduction of integration efforts, increase of robustness, efficient use of energy, reuse of components, enhancement of security features, improvement of cost-effectiveness of development, and reduction of effort for maintenance and debugging through diagnostic services.

*For further information, please visit:*  
[http://www.genesys-platform.eu/workshop\\_munich.htm](http://www.genesys-platform.eu/workshop_munich.htm)

## Conference on the role of third-sector organisations

*A conference entitled 'The role of third-sector organisations in changing welfare systems in central and eastern European countries' will take place in Ljubljana, Slovenia, on 5 and 6 February 2009. It is organised by the EU-funded 'Civil society and new forms of governance in Europe: the making of European citizenship' (Cinefogo) network of excellence (NoE).*

Third-sector organisations (i.e. organisations in the voluntary or non-profit sector) in central and eastern European countries reveal similar characteristics that simultaneously distinguish them from third-sector organisations in other societies. These inward similarities and outward differences can be explained in the context of the state-socialist type of welfare system that prevailed in these societies for almost half a century.

There has been a 'boom' in the development of third sector organisations after the system change. However, the third sector

in these countries is still heavily ambiguous. Moreover, despite the general similarities there are striking differences in the level of development and characteristics of third sector organisations that emerged in a relatively short period in these societies.

The primary aim of the conference is to search for and explain the interdependence among changes in entire welfare systems and changes in the importance, character and the role of third-sector organisations in central and eastern European societies.

*For further information, please visit:*  
<http://www.cinefogo.org/workpackages/wp46/wp46-conference-2009>

## Symposium on safety, security and space

*The International Space University (ISU) is organising its 13th annual international symposium under the title 'Space for a safe and secure world' from 18 to 20 February 2009 in Strasbourg, France.*

The symposium is intended as an interdisciplinary forum to help both users and providers of space-related systems move forward from the discussion of problems to the formulation of innovative solutions.

Topics to be addressed during the meeting include:

- international goals and perspectives on security;
- civil security;
- homeland and national security;
- military space and dual use;
- space assets and the space environment;
- making Earth safer and more secure.

*For further information, please visit:*  
[http://www.isunet.edu/index.php?option=com\\_content&task=view&id=443&Itemid=298](http://www.isunet.edu/index.php?option=com_content&task=view&id=443&Itemid=298)

## Conference on technology transfer

*The 5th international technology transfer days 'Biomaterial 2009' will take place on 19 and 20 February 2009 in Erfurt, Germany. The conference will mark the completion of the EU-funded 'Creating international cooperation teams of excellence in the field of emerging biomaterial surface research' (Incomat) project.*

One of the main tasks of Incomat is to identify where biomedical research could

make a significant impact on the quality of life of all European citizens.

In this context, the most important objective of Biomaterial 2009 is to identify the scientific areas where cutting-edge developments could provide the basis for innovative implants for hard tissue applications. The event focuses on the following thematic aspects, each covered by a keynote lecture:

- bone as a load adapted hierarchically organised composite material;
- future of scaffold fabrication for bone tissue engineering;
- biomimetic analogue coatings;
- perspectives of advanced *in vitro* testing;
- consequences for quality assurance and product certification.

*For further information, please visit:*  
<http://www.biomaterial2009.de>

## Nuclear safeguards and non-proliferation course

*The 5th academic course in nuclear safeguards and non-proliferation is organised with the support of the European Safeguards Research and Development Association (Esarda). The one-week course is hosted by the Joint Research Centre's (JRC) Nuclear Safeguards Unit in Ispra, Italy, and will take place from 30 March to 3 April 2009.*

The course is recognised by the European Nuclear Education Network for the Master degree in nuclear engineering. Top level teachers from the IAEA (Vienna), Euratom (Luxembourg), AREVA (France), the British Nuclear Group (United Kingdom), EU national regulatory bodies, high-class EU and American research centres and universities together with Esarda assure the quality of the programme.

A comprehensive overview of safeguards and non-proliferation matters in Europe and abroad is provided covering scientific, technical, legal, and some political aspects. Visits to safeguards laboratories complete the course. Due to increasing success, a number of 60 participants has been set so that early registration is recommended.

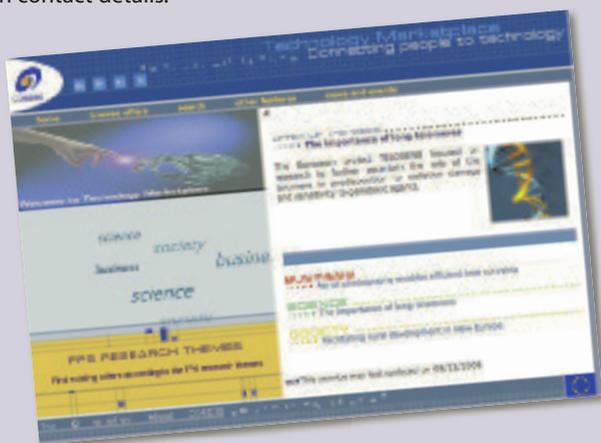
*For further information, please visit:*  
[http://esarda2.jrc.it/internal\\_activities/WC-MC/Web-Courses](http://esarda2.jrc.it/internal_activities/WC-MC/Web-Courses)

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