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Climate change tops the list

On 11 and 12 December 2008, the European Council agreed
on a bold set of climate and energy measures aimed at tackling
the ever worsening problems related to climate change and the
EU's reliance on fossil fuels. The package foresees a reduction
of carbon dioxide emissions and the increased use of renewable
energy sources. In order for these targets to be met, one player
will have a key role to play: research. This publication is making
its own little contribution to the subject by presenting some of the
research projects funded by the EU to meet these ambitious goals.



Allergies are known to be one of the consequences of pollution.
The lead article for the biology and medicine section describes
a project that studied the more specific link between diet and the development of infectious
diseases and allergies during infancy. A survey carried out in five European countries
compiled data concerning children's lifestyle, diet and disease, generating some very
interesting results.

The opening article of the energy section presents the achievements of the Trend-2 project
whose scientists studied the feasibility of sustainable, secure, safe and clean energy supplies.
The main objective pursued by the members of the project was to help the oil and gas
industries meet the challenges posed by the rising social responsibility they are faced with.

Though around 71 % of the Earth's surface is covered by oceans mankind has mainly
studied the planet's landmass, leaving the largest part of our planet unexplored. The article
introducing the environment section uncovers how scientists from the ASOF-N project have
made their bit to curbing this trend. Their aim was to study the variability of heat fluxes
in fresh water flows between the North Atlantic and Arctic Oceans using specially designed
observation tools to do so.

In a world increasingly relying on wireless communication, yet dominated by different
standards, researchers looked at ways to improve commonality. The lead article in the
telecommunications section describes how the FLOWS project analysed the convergence of
standards to ensure reliable high-performance multimedia services.

The industrial technologies section opens up with an article on nanotechnologies applied
to prosthodontics. The aim of the Catipro project was to produce optimised titanium-based
nanomaterials for a wide variety of dental applications. Indeed, titanium offers better
biocompatibility and corrosion resistance than conventional dental alloys.

Last but not least, the events section offers you a non-exhaustive overview 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

The editorial team

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To read up on the project presented in the offer, click on 'view related results' at the
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RNA probes for infant allergy research

Scientific research points to a link between diet, particularly in infancy, and development of infectious diseases and allergies. Partners in the EU-funded project Infabio have developed a probe for two micro-organisms implicated in the underlying mechanisms involved.

The importance of infant diets in relation to their predisposition to diseases and allergies cannot be understated. Another major factor involved in infant health is the role played by intestinal microbiota. Many species, in particular bacteria, inhabit the human gut and the correct balance is essential for a state of symbiosis to prevail.

To this end, researchers under the umbrella of the Infabio project, conducted a comprehensive survey of infants in five European countries. Data concerning lifestyle, diet and disease was compiled in a bid to unravel the complexities of the development of allergy and disease.

Specifically, project partners at INRA in France developed an assay to identify strains of bacteria present in the gut that may be re-

sponsible for delayed tolerance in infants. Individual probes, one for each of *Clostridium perfringens* and *Clostridium difficile* were developed to specifically detect and quantify the two faecal bacteria. Validation of the probes followed using a variety of techniques including fluorescent *in situ* hybridisation (FISH) with flow cytometry and faecal samples inoculated with the *Clostridium* strains. The 16S ribosomal RNA probes were defined using databases from the 'Ribosomal database project'.

Armed with these two novel probes and another eight previously developed, the predominant faecal microbiotic groups present in infants ranging from 1.5 to 18.5 months were identified. As one of the potential causes of allergic and infectious disorders, the relative proportions of the two *Clostridium* species were quantified. The predominant species within the gut flora were also identified and found to belong to the *Bifidobacterium* genus. In contrast to *Clostridium*, *Bifidobacterium* is associated with a low incidence of allergy and aids digestion.

The data accrued from this research lies at the very heart of the biochemical processes underlying nutrition, disease and its biochemistry. As such, it is of interest to commercial industries such as the infant food industry right through to the public health agencies responsible for the promotion of practices such as the importance of breast feeding.

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

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

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Measuring youngsters' quality of life

Researchers developed a report instrument to assess the health-related quality of life of children and adolescents living in Europe.

The aim of the Kidscreen project was to address the lack of hard data regarding the quality of life of children and adolescents within the community. Researchers developed a European-wide standardised screening instrument for reporting on the perceived health of children.

The information obtained was used in representative national and European health surveys. These report measures also identified those children at risk and was able to propose early intervention strategies. Furthermore, the Kidscreen project examined the impact

of chronic health conditions on youngsters. They also took into consideration social and behavioural factors as well as an individual child's perceived state of health. Following the report instrument's development the standardised measures and determinants were to be used in population surveys within the participating countries and evaluated and applied in national health services.

The Kidscreen-52 self-report measure can be administered in hospitals, clinics and schools by health professionals, scores being calculated for 10 separate health-related values. The results

for each participating country can be viewed according to age, gender and socio-economic status. The reporting instrument was applicable to both healthy and chronically ill children and adolescents between 8 and 18 years of age.

The project involved 13 European countries in the development of the measures. The questionnaire produced by the research team was based on literature reviews, consultation with experts and children's focus groups. The pilot was tested using data on more than 3 000 children and adolescents from across the EU.

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

Collaboration sought: information exchange/training.

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Frequent acronyms

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

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

Alternative pathways lead to allergic response assay

Toll-like receptors (TLRs) have the potential to change the nature of an immune response in vitro. ALLDNAVAC, an EU-funded project, has researched using TLRs as the basis of a simple assay for testing the extent of an immune reaction.

Many disorders are thought to be linked to allergic responses. Finding potential therapies is highly alluring, both in terms of relief for the millions of sufferers and progress in the biopharmaceutical arena. The ALLDNAVAC project ploughed its resources into research on developing novel DNA vaccines, one possible treatment for allergies.

Overall, the objective of the project consortium was to investigate the efficiency and side effects of new plasmid DNA vaccines against human allergic diseases. The project team at the University of Firenze,

Italy, developed a simple, effective assay to measure the extent of the immune response to a given vaccine.

The immune response is a cascade of events that can be manipulated biochemically at various key stages. When an allergic reaction takes place, an allergen presenting cell (APC) displays the allergen to a T-cell which can then mature to form a T helper (Th) cell.

Harnessing this pathway, the scientists applied TLRs agonists, including Resiquimod

and Imiquimod *in vitro* to activate APCs. The presenting cells then induced the overproduction of pro-inflammatory cytokines. Together with the allergen, these factors switched the production of Th2 cells from allergic patients to T-cells that produced interferon-gamma (IFN-gamma).

The presence of IFN-gamma constitutes a simple assay which can therefore be used to gauge the extent of a Th2 immune response in a patient. An extension of this research could be in the development of therapies for diseases involving Th2 lymphocytes and may well form the basis for other novel vaccines.

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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Food allergen tests speeded up

Food allergies may pose a serious threat to health. Partners in Redall, an EU-funded project, have devised rapid, sensitive new tests for the detection of trace amounts of allergens in food.

It is estimated that 8 % of children and 2 % of adults have food allergies. Moreover, the incidence has increased over the past few decades and is continuing to escalate. Common allergens with an animal origin include milk, egg and seafood.

Even mild allergic reactions to food allergens can be unpleasant and may include itching, swelling of soft tissue and breathing and digestive problems. Anaphylaxis is a severe reaction to any allergen including food and can be fatal. There is therefore huge pressure on manufacturers to detect and eliminate food allergens for those who suffer from this potential threat of allergic reactions.

In response to this demand, the Redall project aimed to improve safety within the food industry. In particular, project partners concentrated on improvements in food technology for processed food to prevent allergen contamination.

Researchers at the University of Leeds devised tests, one in 'dipstick' form and the other incorporating a biochip sensor. The technology is based on resonance-enhanced nanocluster detection and is applicable at all stages in food processing. Raw materials as well as intermediate and final stages yield accurate results.

Speed of allergen determination throughout food processing is an important factor and

the new protocols devised are completed in a matter of minutes. By contrast, alternative methods are the rapid DNA extraction test prior to polymerase chain reaction (PCR) testing which takes half an hour. Even more laborious, the cetyltrimethylammonium bromide (CTAB) extraction test gives results after three hours.

Detection limits of trace amounts of skimmed milk powder, beef and chicken are very acceptable and are 10 times as sensitive as the CTAB method. The speed, robustness and low cost of the new methods could well provide the food industry with the weaponry it needs to reduce the allergenicity of foods.

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

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Asthma protection in children brought up on farms

Protection against asthma and atopy in children brought up on farms was confirmed in a recent study. The investigation showed that children living on farms suffered less as a result of outdoor allergens than the control group.



The prevention of allergies in animals can be achieved through the inhalation of microbial products. At present it is not certain if these findings can be extrapolated to humans. However, researchers have discovered that the children of farmers brought up in surroundings rich in microbial matter form an ideal natural model. This model can be used to study the phenomenon of allergy prevention in people.

The aim of the Pasture project was to confirm the protective effect against asthma and atopy found in children growing up on farms. These children were compared to their peers who also lived in the countryside, but not on farms. The project also intended to determine the environmental factors that helped to bestow this protective effect.

Questionnaires were used in the study, which also involved a clinical visit by the children at one year of age, and the analysis of blood samples. Environmental samples such as house dust and cow's milk were also examined. The fieldwork was carried out in five European countries.

continued on page 7

Antimicrobial resistance on the rise

The problem of antimicrobial resistance is escalating. The EU-funded project Antres researched into the extent and possible causes of resistance in Bolivia and Peru.

It seems that one of the main reasons for antimicrobial resistance is indiscriminate and overuse of antibiotics. In many countries, antibiotics are sold over the counter in pharmacies and self-medication is therefore an option, particularly where medical help is either unavailable or expensive.

Project partners from the University of Florence followed two lines of research in urban and rural areas of Peru and Bolivia. First, they determined the incidence of resistance to a full range of antibiotics by the bacterium *Escherichia coli* (*E. coli*) in four urban areas. As a comparison, they also studied the extent of resistance in a very small remote

area in Peru inhabited by 93 Amazon people with very limited access to antimicrobials.

The four urban areas contained a high number of healthy carriers of *E. coli* resistant to antibiotics that had been in general use for over 50 years. These included ampicillin and tetracycline. There was a lower resistance level but still relatively high in other less commonly used antibiotics like gentamicin, nalidixic acid and ciprofloxacin. By contrast, less than 1 % showed resistance to expanded spectrum antibiotics, cephalosporins and amikacin.

The remote community in Peru showed some surprising results. There was an unex-

pectedly high resistance rate that could not be explained by antimicrobial consumption alone due to the remoteness of the situation.

However, the overall results are evidence of a very steep rise in resistance to many of the antimicrobials in the screening tests. The underlying trends were the same in all four urban areas under study leaving no doubt that resistance generally is on the increase. These results can form the basis for a continuing collection and analysis of data so that the trends in antimicrobial resistance can be identified and explained.

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 > 4487

Infant protein diet has an impact on obesity risk

Obesity represents a major challenge to the health of nations worldwide. Chopin, an EU-funded project has researched into the impact of protein intake in infants on the risk of obesity in later life.

Obesity poses short- and long-term health risks for the individual. In terms of the burden on the health system, it is detrimental and costly. Health bodies have long been aware that to remedy obesity, lifestyle changes must be implemented within family members at an early age. There is also a growing body of evidence that nutrient composition of diet in the infant can have an impact on risk of obesity in later life.

The Chopin project investigated whether infant feeding regimes were responsible in part for the development of obesity as adults. Aspects of diet and lifestyle were researched by individual project partners. Specifically, the team based at the Children's Memorial Health Institute in Poland researched the effects of raised levels of proteins in an infant diet on growth factors, specifically those related to insulin.

factor were measured. As a measure of insulin secretion, urine levels of C-peptide/creatinine ratios were monitored. Concentrations of a total of 18 amino acids in the blood were also measured.

The data collected supports previous studies in that a high-protein formula feed stimulates the production of insulin-like growth factor. Because glucose levels were not elevated, higher insulin may be due to levels of some branched chain amino acids like leucine that are linked to production of the hormone. Higher amino acid levels found in serum could play an important role in insulin-related metabolic activity and so be linked to a propensity towards obesity.

Many health authorities have been encouraging mothers to breastfeed their babies for many decades. The biochemical basis for this advice can help to reinforce the message and improve the health of nations as a whole.

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

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Blood and or urine samples were taken from infants in four countries in Europe at three and six months of age. Infants fed on high protein formula feed were compared with those receiving a low protein formula diet. Serum concentrations of insulin-like growth factor (IGF-1) and IGF-BPs, the binding proteins that control the distribution and activity of the growth

continued from page 6 'Asthma protection in children brought up on farms'

The research has provided a body of information regarding variation in the prevalence of atopic disease between children from farms and non-farm children in rural areas. This set of data is believed to be unique throughout the world. It has highlighted new insights into the role of lifestyle, genetic factors and other determinants. It has provided a great opportunity for future epidemiological studies.

The project was able to confirm the protective farm effect identified in previous cross-

sectional studies involving the Pasture birth cohort. This was because the prevalence rate of asthma and atopy for parents and siblings were significantly lower for farming families than for non-farming families.

When the Pasture research team examined the factors behind this farm effect, they found that the exposure of mothers to farm animals and barns was of importance. It led to a difference in cytokine levels in cord blood between farm and non-farm children.

Furthermore, non-farmers had higher levels of cord blood IgE antibodies to outdoor allergens, such as grass pollen. In contrast, farm children had higher levels of IgE antibodies to food allergens.

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

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Pooled data towards cervical cancer cure

Every year, tens of thousands of women die in the EU from cervical cancer because the disease is not detected and treated at an early enough stage. A multidisciplinary European research effort plans to change that.

Half of all the 60 000 new cases of cervical cancer diagnosed in Europe this year will prove to be incurable and result in the patient's death, and a similar percentage of the hundreds of thousands of women diagnosed worldwide will also die. To make any impact on these statistics, medical researchers will need access to huge amounts of data on cervical cancer victims, the sort of data collected and analysed in what medical professionals call association studies.

Thanks to the work of the 2008 Nobel Prize-winning scientist, Harald zur Hausen, we know that cervical cancer is caused by the human papilloma virus (HPV). But not every woman infected with the virus develops the disease, while some of those who do develop it respond to treatment, and others do not. There is also the complication that there are many different variants of HPV, and not all of them cause cancer.

To try and understand these discrepancies in different patients, and what the root causes are, it is necessary to examine as much information as possible about as many patients as possible to try and identify common factors. Association studies do this by studying clinical data from hospital tests, lifestyle data such as eating, smoking and sexual habits and genetic data. They also compare the data with that from healthy patients not infected by the virus.

Until now, these tests have generally been undertaken at individual clinics and medical centres where researchers only had access to data concerning tens or perhaps hundreds of patients. The EU-funded Assist project was

set up to forge technological links between leading medical centres specialising in the diagnosis and treatment of cervical cancer, to allow them to share data and thus create a much larger data repository.

'What we are trying to do is to allow medical researchers working in specialist hospitals and medical centres to use each other's data, and combine the data into a bigger pool to work with,' says project coordinator Professor Pericles Mitkas of the Centre for Research and Technology — Hellas, Informatics and Telematics Institute, Thessaloniki.

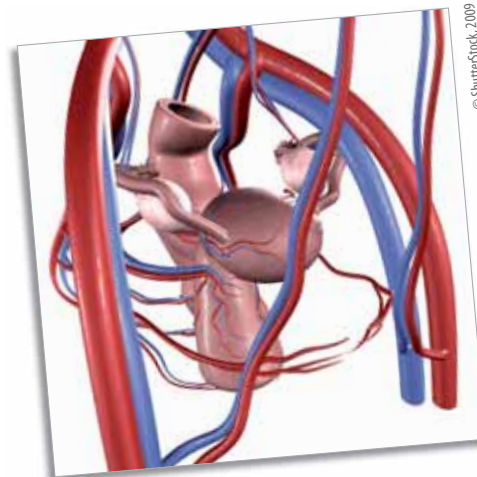
While this may sound logical and easy, in practise it is not. 'The problem is, each hospital uses different formats, different rules for storing data, even for exactly the same tests. Even within hospitals, each doctor might have his or her own way of doing things,' says Professor Mitkas.

The challenge is primarily an IT one, but it requires doctors from various disciplines — researchers, microbiologists and geneticists at the different centres — to agree to adopt common practices for the system to work. 'Perhaps the greatest achievement of the project to date has been to get medical doctors, molecular biologists and computer scientists sitting around a table and talking to each other, and finally understanding each other's technical language,' says Professor Mitkas.

There are three hospitals involved in the initial stage of the project, from Belgium, Germany and Greece. Professor Mitkas says it was also an achievement to get the doctors from these institutions to agree to 'common terminology, common ground, and a common view on how to represent data and access it.'

With these agreements in place, the team developed a prototype software platform which ensures researchers get data reported back to them in a similar format and in the exact way in which it was requested. 'We do this by semantic representation, which means we assign an interpretation to each value to help the computer understand what each value refers to,' Professor Mitkas explains.

'We also facilitate interpretation of subjective values like "high risk" and "low risk", "serious cases" and



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"non-serious cases", and use inferencing techniques which are based on a set of medical rules provided by doctors to tell the computer which results are more valid than others. Biopsy results, for example, are more conclusive than Pap test results and may point to a pre-cancer stage that a Pap test did not reveal.'

Working with the three hospitals, the Assist prototype platform now allows researchers access to thousands of patients' records at the gynaecology and obstetrics departments of the three hospitals, including the results of annual tests on all women, not just those infected. 'We add extra functionality as we go along, but at least the doctors now have something to work with and evaluate,' says Professor Mitkas.

The project recently hosted a conference where the platform was introduced to some of the leading cervical cancer specialists from around Europe, and they were so impressed that several of them have agreed to add their data to the Assist pool.

In the future, the work done on this project can be applied to other types of cancer, with just some adjustments being needed to the software to cope with different data sets, Professor Mitkas suggests. And there is no reason why the platform cannot be used with other types of disease such as cardiovascular, he says.

'Further down the line, understanding the path to the disease and the factors that affect it will help individual doctors diagnose it earlier, prevent it by giving directions to their patients, and developing drugs or procedures that will cure the disease. But Assist is primarily a tool for medical researchers, and the results of their research will benefit all women,' Professor Mitkas concludes.

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Linking breast cancer to diet

Breast cancer can be attributed partly to specific genetic factors. Predisposition however is not the only influencing factor.

Lifestyle practices are said to play an important role in the incidence of breast cancer especially at young ages. The EU-funded 'Case-only study' project focused on analysing dietary effects on breast cancer onset. The study that was carried out enrolled approximately 5 000 breast cancer patients, who were diagnosed before the age of 40.

The study examined the interaction between the breast cancer susceptibility

genes BRCA1 and BRCA2 and dietary habits. It has long been known that mutations in these genes can increase the breast cancer risk in their carriers. Reducing this risk is a challenging task and for many it might include prophylactic bilateral mastectomy and oophorectomy.

The study indicated that dietary habits can indeed play a role in reducing the risk associated with BRCA mutations. Increasing

the intake of cruciferous vegetables such as broccoli, cabbage, cauliflower and Brussels sprouts is likely to prove beneficial. Similar preventive effects were attributed to the elimination of cow's milk from the diet.

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

Collaboration sought: further research or development support.

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Binding sites are the key to anti-cancer therapy

Retinoids and rexinoids have well-documented anti-cancer properties. Scientists have investigated this anti-tumourigenic action at the molecular level.

Retinoids and rexinoids can interfere with, and in some cases totally prevent, the progression of a cell in its development to tumour status. Apoptosis, or programmed cell death, can be induced directly using retinoids and rexinoids during chemotherapy. These molecules can also prevent differentiation of a progenitor cell induced by a tumour promoter.

The EU-funded 'Anticancer retinoids' project aimed to develop new types of retinoid that possessed specific cognate ligands. Biological systems rely on ligands for binding to form stable complexes. Specially designed cognate ligands would then selec-

tively bind to molecules in various pathways to effect an anti-tumour action.

As an integral part of this research, scientists at the Departamento de Química Orgánica in Galicia, Spain, investigated the mechanics of ligand binding to retinoid receptors, known as retinoid X receptors (RXRs) and retinoic acid receptors (RARs). The cognate ligands could then be ranked according to their ability to adapt to the shape of the binding site. The next step was to then engineer ligands to specifically bind with a retinoid receptor.

The study delved into the energetics of bonding. The electrostatic and van der

Waals forces that come into play for attraction at binding sites were investigated. For example, the carboxylic groups present in RXRs and RARs possess a difference in polarity. This means there is a large difference in interaction energy between these two receptors and the same ligand.

Based on the outcomes of this research, project partners aimed to build RXR sites utilising the phenomenon of binding site polarity. This can then be harnessed to create the specific mode of action required in anti-cancer drug therapy.

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

Collaboration sought: information exchange/training.

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Melanoma and intermittent UVB exposure link

Despite widespread media coverage regarding the danger of exposure to the sun, the incidence of melanoma is still on the increase in many countries. Scientists have investigated the effects of the ultraviolet light that reaches the Earth, UVA1 and UVB, in the proliferation of melanocytes and ultimately development of melanoma.

Under the net of the EU-funded project MAUVE, scientists aimed to determine the genetic mechanisms involved in the development of cutaneous malignant melanoma (CMM). This form of skin cancer can be highly malignant even at its early stages and is therefore a huge source of concern in the medical and public arenas alike.

Exposure to sunlight causes the increased formation of melanocytes, associated with the formation of melanocytic lesions that can be benign or malignant. On overexposure, damage to DNA triggers melanocytes to produce melanosomes which can migrate to the top keratinous layers of the skin and form a melanoma.

An occasional exposure pattern to sunlight prevails in the northern hemisphere, for example. This occurs due to low exposure for most of the year and a short intense period, usually taken during sun holidays. Worryingly then, the team at Leiden University found that intermittent overexposure to UVB light was associated with increased melanocyte production. Two situations that did not result in a proliferative response however were sub-sunburn UVB and UVA1 exposure.

Cells, unable to function without the integrity of their DNA have several repair systems to reverse or make good the damage inflicted by agents including radiation and excessive heat. UVB light causes cross link-

ing between adjacent bases cytosine and thymine. This causes direct DNA damage in the form of pyrimidine dimers.

The team then confirmed a biochemical link between damage and overproduction of melanocytes. Animal models deficient in the natural repair mechanism for pyrimidine dimers were shown to be exceptionally sensitive to melanocyte production.

The risks associated with intermittent exposure to UVB radiation have therefore been highlighted and a genetic basis elucidated. Further research will be able to unravel the precise mechanisms involved in DNA damage and repair. This can then form the basis for provision of public health guidelines and development of anti-melanoma drugs.

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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Member of the cabbage family for dietary supplements

Scientists have researched into the genetic basis of vitamin C and folate production in the model plant species Arabidopsis. The plant's close relatives, cabbage and broccoli, could therefore be used to supply these important nutrients.

Arabidopsis is a member of the Brassica family. The key to its ecological success is its rapid life cycle of only six weeks. It is one of the model organisms for study in the plant kingdom and was the first to be genotyped. Another of its inherent advantages is that changes in its morphology which are a reflection of its genotype are easily observed.

Partners of the EU-funded project Natural aimed to capitalise on the natural genetic variety and adaptation in this model plant. Specifically, the team at Wageningen University investigated the possibility of using *Arabidopsis* genetics to produce ascorbate (vitamin C) and folate, which are vital components of the human diet.

Studies on ascorbate revealed the presence of three quantitative trait loci, one of which is closely linked to the gene that codes for an enzyme in the ascorbate pathway. *Arabidopsis* VTC2 encodes GDP-L-galactose phosphorylase, the last enzyme in the pathway to yield ascorbic acid.

Investigation into folate, the nutrient involved in the prevention of neural tube defects during pregnancy, centred on its availability. Glutamation of folate affects its bio-availability as it increases its cellular retention. Assays were performed using a newly developed liquid chromatography/mass spectroscopy method (LC-MS). Studies using the anti-folate compound metha-

trexate revealed that there were at least five QTLs involved. The ultimate aim is to pinpoint genes responsible for the anti-folate phenotype. The next step would then be to manipulate levels of folate in crops.

Nutrigenomics, a rapidly expanding section of the biotechnology industry, has great potential to lead Europe into a key position in the biopharmaceutical and plant breeding arena. As such, the humble cabbage may be able to deliver measured and adequate doses of some of the basic nutrients.

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 > 4468

See also page 15 (From little things big things grow)

Slow release glucose from wholemeal bread

There is a growing body of evidence that slowly digestible starch may help prevent type II diabetes and cardiovascular disease. Project partners from the EU-funded 13C-Starch project have measured the effects of different types of glucose availability on metabolism in nutritional studies.

Intake of food for long-term sustained activities recommends a mixture of slowly digestible starch and rapidly available glucose (RAG). That way, even through long arduous activities, energy supply is ensured. The time taken to digest different starch elements was previously thought to be the reason for the continual-release energy effect.

Partners from the 13C-Starch project have broken new ground to unravel the complexities of the glucose metabolic pathways after the breakdown of starch. Previously, glycaemic index and time for digestion have received most of the research attention. However, project consortium partners also investigated the different sources of

glucose after a meal. These involved glucose produced endogenously and tissue distribution.

In order to achieve this, they compared two different types of food. They produced a traceable source of starch in wholemeal bread baked from wheat grown in 13C carbon dioxide (CO₂). Four healthy men were given wholemeal bread or glucose in water in a crossover trial. To monitor endogenous glucose production, a continuous infusion of D-[6,6-2H₂] glucose as a tracer was also administered. During the six-hour period after a meal, the traceable carbon was measured in breath as CO₂ together with plasma glucose and insulin levels.

The data collected questions the reasons behind observed blood glucose levels. Initial insulin levels were around 40 % lower after wheat bread than with glucose. However, glucose production was suppressed after wheat bread as compared with glucose in water. It would appear therefore that rate of digestion of starch is not totally responsible for this effect and there are other factors, possibly within the composition of the wheat bread.

Starch products, including bread are the staple food of many areas of the world. There is therefore scope for food companies to create a truly functional food out of a basic staple that helps to prevent chronic disease.

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 > 4386

Surgical synergy for the spinal cord

Project partners in the EU-funded project Minosc have developed a novel endoscope with superior navigational ability. Its accuracy and efficacy were evaluated during spinal cord surgical procedures.

Disabled people suffering from spinal conditions such as trauma and tumours develop lesions of the spinal cord. Successful treatment usually requires myelotomy or direct visualisation of the spinal canal using an endoscope. This involves entrance to the cerebro-spinal fluid and images of any lesions and required nerves can then be obtained.

Due to the highly sensitive nature of the spinal cord where damage can be crucial, a minimally invasive technique is required. In response to this demand, project partners in Minosc refined the positioning ability of the endoscope which can be based on anatomical landmarks recognised by the surgeon. The system developed used a minute

magnetic sensor at the end of a flexible endoscope.

Armed with the superior localisation ability of the endoscope, partners at the University of Montpellier investigated the treatment of four different pathologies using the Minosc endoscope. Making an entrance into tissue gave surgeons an opportunity to perform a range of procedures at the same time using associated equipment.

continued on page 11

Online diagnosis and treatment for skeletal dysplasia

The 'European skeletal dysplasia network' (ESDN), an EU-funded project, has developed an online case manager system for patients with skeletal dysplasia. Skeletal dysplasia is a generic term for a range of over 200 conditions that involve the development of bony tissue. The phenotypes range from very mild symptoms to severe and lethal types and include the conditions achondroplasia and neurofibromatosis.

The challenge for ESDN was to devise a system whereby medical professionals could pool data from research and details of patients' cases. An online consultation and feedback forum could then be created with the overall aim of case characterisation, diagnosis and relevant treatment, if appropriate.

The system was developed by Certus Technologies Associates Ltd. Features include secure online case detail entry and a discussion system that allows groups of experts to con-

tribute to the review of a case. An important implication is that all European citizens would have equal access to diagnosis and treatment regardless of their geographical status.

Moreover, input of data on such a wide scale with feedback means that there could be external quality assessment of laboratory test procedures. Given the range of occurrence of these disorders, a pan-European approach would enable the results of multidisciplinary research to be translated into improved refined clinical practice.

The system can be accessed online (<http://www.esdn.org>) where comprehensive details of centres and their specialities in terms of diseases and genes screened are given. Practical issues such as submission of radiographs and procedure for referral of a case are detailed. There is also a page for newsletters and the status quo on latest research.

Although this particular project dealt with aspects of skeletal dysplasia only, the system may be applied to any group of disorders that warrant online medical analysis. Elements of the system have been incorporated by the Health and Consumer Affairs DG in several other EU projects.

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 > 4469

Teeth reveal bone density status

Osteoporosis diagnosis is achieved mostly through access to bone densitometry data. However it is not always readily available even though the disease is threatening a significant proportion of the European population.

The EU-funded Osteodent project was set up to investigate the suitability of dental radiography as a diagnostic tool for osteoporosis. Dental radiography is likely to pro-

vide as much information regarding bone density as traditional monitoring methods. The project had aimed to recruit a total of 600 women at various stages of the menopause in order to test the hypothesis.

In trying to achieve the project's aims, project partner University of Manchester generated a database comprising mandibular cortical width data obtained from dental panoramic radiographs. The data from 661 volunteers aged 45 to 70 were obtained using newly developed software.

Out of the group, 140 women were classified as having osteoporosis.

The results indicated that dental radiography can be an effective diagnostic tool for osteoporosis and its use could indeed signal a breakthrough in osteoporosis diagnosis. Further research is warranted in order to determine the appropriate diagnostic threshold in a clinical setting.

Researchers also believe that the dataset may be potentially useful in the field of dental implants, allowing insights into bone quality through cortical thickness data. Overall, the innovative approach which this dataset represents could pave the way into further developments in this area.

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 > 4177



continued from page 10 'Surgical synergy for the spinal cord'

The four pathologies allowed the team to explore both the effectiveness of these procedures and the safety aspect of the novel endoscope. Conditions targeted included traumatic lesions, malformations (for example *spina bifida*), tumours, and post-surgical arachnoid reactions.

The fluid system of the Minosc constitutes another key to its success in the surgical procedures. For example, neurotransmit-

ters were injected for neural regeneration after traumatic damage of the spine. Use of a very thin catheter for drainage of cysts in malformations present in *spina bifida* was also achieved. For post-surgical arachnoid reactions, hydrodissection was used for gentle cleaning.

The possibilities for the use of Minosc could be extended with the association of other surgical appliances. The achievement of safe

images within a sensitive area like the spinal cord can be married to non-invasive techniques for full utilisation of surgery.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4458

Peptide-based vaccine for farmed fish

Research by the Peptidex project in developing efficient vaccines against viral fish pathogens could reduce the economic cost of disease outbreaks to producers. Aquaculture will become a major industry in the future and will bring jobs to rural areas; activities which aid fish farms can therefore help the local economy.

Salmon and trout are of considerable economic importance both for aquaculture and in providing sport to anglers. It has been predicted that the production of farmed Atlantic salmon and rainbow trout in Europe will expand rapidly. Furthermore, brown trout is also farmed on a large scale and the production of non-salmonid, like seabass and sea-bream, is set to increase.

The work of Peptidex also reduces the environmental impact of an outbreak by reduc-

ing the spread of disease to wild populations of fish. The study has encouraged similar studies in other farmed species and has the potential to significantly increase production.

The Peptidex viral pathogen epitope prediction programme promises to benefit future vaccine design by providing techniques easily transferable to a range of cultured fish. Moreover, peptide-based vaccines are safer for those administering the vaccine than

conventional methods and the fish themselves experience fewer side effects.

Food safety is of major concern to governments and consumers alike. Current DNA-vaccine constructs raise a number of concerns. However, peptide vaccines avoid these shortcomings by being administered in a non-replicative peptide form.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4510

Recycling waste from fish farms

Carbon supplemented waste from a pilot-scale fish farm was studied for its suitability to act as a substrate for the production of heterotrophic bacteria.

The Zafira project combined Western recycling technology with traditional Chinese aquaculture techniques. It designed a fish farm that would discharge zero nutrients and used bacteria to produce single cell protein.

The project's aim was to find a viable way to recycle waste from catfish farms. An innovative, integrated system of aquaculture was developed which minimised water use and the discharge of waste and nutrients to the environment.

Waste from a pilot-scale fish farming unit was studied for its suitability as a substrate

for heterotrophic bacteria production. By supplementing the substrate, firstly with sodium acetate as a reference and then molasses, bacteria production increased substantially.

This method not only converted the solid waste but also 90-95 % of the dissolved nitrogen and phosphorous. Researchers also studied other limiting factors such as carbon supplementation levels, different sources of nitrogen and variations in hydraulic retention times. The bacterial product was analysed and its potential as an aquatic feed was investigated.

The final part of the project concentrated on the hypothetical reactor design for a 100 t African catfish farm. Experiments undertaken by the researchers indicated that the production of bacteria biomass from solid waste originating from fish was feasible. However, given the current level of knowledge it would only be economic at small volumes.

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 > 4524

See also page 23 (Algae and herbivores combat eutrophication)

Drug screening hits poultry producers

Food safety is, and always must be, a non-negotiable, inviolate issue. Despite stringent laws and the highest of standards, consumer health may be at risk. Recent research reveals that in the case of EU poultry, preserving the integrity of food is sometimes a double-edged sword.

Coccidiostats are veterinary drugs used to treat animal protozoan infections. The poultry industry has been, and is using them extensively with the result that now, it has been determined, coccidiostat residues in poultry may pose a health threat to humans. Research has indicated that some of these drugs may even be carcinogenic.

To safeguard instances of coccidiostats ever posing such a threat, high-quality test kits have been developed for coccidiostats alofuginone, nicarbazin and nitroimidazoles. These kits come in the form of microtitre wells coated with anti-rabbit IgG and having the analyte-specific antibody immobilised to the well.

Having developed a prototype dispensing unit, the scaling-up phase proved difficult. As a result, a smaller scale label dispenser was then developed. However, time constraints prohibited this system from being realised during production so the label was manually fed to the wells.

During accelerated stability testing it was shown that results were in accordance with real-time stability tests, indicating that the kits were stable for up to a year at least. With the distribution of the know-how (technology transfers) of such kits now

possible, and screening and conformity methods being thoroughly validated, cases of specific coccidiostat residues in poultry should be significantly reduced.

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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Immunological response to swine fever virus

Classical swine fever remains a serious threat to the pig industry. Scientists with IMPCSF, an EU-funded project, have researched the immune response of pigs infected with swine fever with the overall aim of developing vaccines.

The classical swine fever virus (CSFV) causes the highly contagious disease swine fever. Effective control of this disease is problematic as infection with less virulent strains may be chronic. Infected piglets birthed into the population may then act to maintain swine fever in the farming unit. Moreover, wild animals like the boar are a very potent source of the virus.

The IMPCSF project aimed to research marker vaccines with the specific intention of providing early protection. As part of the project's research into the immunological responses involved, German-based scientists at the Friedrich-Loeffler Institute for Animal Health identified CSFV-specific T-cell epitopes, parts of the antigen rec-

ognised by antibodies. In particular, they focussed on the major histocompatibility complex (MHC).

The first step was to induce the production of lymphocytes in the pigs. In order to accomplish this, pigs were inoculated with the CSFV strain Glentarf. The scientist used a lympho-proliferation assay on peripheral blood mononuclear cells (PBMCs) for T-cell monitoring.

The identification of T-cell epitopes involved techniques including the use of hydrogen-3 labelling of thymidine and overlapping peptides obtained from the Glentarf strain. The assays identified 26 peptides from the viral protein. Characterisation of the T-cell

epitopes was achieved using CFSE staining and flow cytometry. The team found that CD4+ T-cells were mainly involved and antigens present on the cell surface included MHCII.

To gain further insight into the activation potency of the T-cell epitopes, they were synthesised to identify the amino acids that bind to the MHCII complex. To achieve this, the amino acids at different sites were substituted and cellular immune responses were then assayed.

A sustainable swine fever control programme based on vaccination will increase the competitiveness of the European pork industry. Furthermore, it will protect the livelihood of pig farmers amidst the threat of mass culling in the event of an outbreak.

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

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Improvement of expression for sheep virus proteins

Small ruminant lentiviruses can cause significant economic losses for European sheep farmers. The EU-funded project MVAC has investigated the production of antigens for immunological testing for one of these viruses, the Maedi visna virus (MVV).

The MVV causes encephalitis, arthritis, mastitis and chronic pneumonitis in sheep and as such, poses a real threat to the general well-being of the animal. Development of vaccines for the prevention of lentivirus infections have proved problematic. Reasons for this include lack of information on target antigens that will stimulate an immune response in the animal to fend off infection.

As part of the overall research into MVV, project partners from the University of Torino, Italy, aimed to develop viral proteins for use as antigens in immunological

assays. To determine levels of immune response, lymphocyte T-cell proliferation and cytokine production were measured. The ELISA (enzyme-linked immunosorbent assay) was also used to gauge the extent of the reaction.

Two sets of viral proteins were expressed during the research. Viral structure consists of an outer envelope which surrounds an inner capsid, which in turn encloses the nuclear material. Capsid proteins were expressed using *Escherichia coli* (*E. coli*) and then purified for use in immunoassays. The

team also worked on protocols for expression of envelope proteins. Three genes coding for the proteins were bound to expression vectors and then transformed into various mammalian cells. To remedy initial lack of expression, a system of codon optimisation was used. This involved matching the codon (coding for the protein) frequency with that of the host cell expression system. This time, expression was observed.

Vaccine development would offer protection from the insidious threat of MVV. The recombinant envelope proteins developed under this research can be used as a basis for further investigation into use in vaccines or as diagnostic reagents in immunoassays.

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 > 4382

Innovative plasmids for DNA vaccination

The development of lentivirus vaccines has been hampered by limited knowledge on a variety of physiological issues. The EU-funded MVAC project sought to improve the scientific knowledge on lentivirus DNA vaccination using sheep models.

The aim of the project was to evaluate DNA vaccines in sheep challenged with *Maedi visna virus* (MVV). The immunisation of the sheep included a series of genes encoding for MVV core or envelope elements. The MVV genes were included in adenoviral plasmids.

Project partners cloned the p55gag and gp150env precursor MVV genes and used

them for the synthesis of a eukaryotic plasmid expression vector. These vectors can be used as immunogens but can also be utilised for the study of the gag and env proteins. The gag and env gene products are essential precursor viral components, which give rise to a series of viral proteins.

Research teams involved in this area could indeed benefit from the use of these plas-

mids. The env precursor gene from MVV had in fact not been expressed from a plasmid construct until this research and represents an innovative successful element of the entire project. The development of an effective vaccine strategy in this field is also likely to boost the application and utilisation of these plasmids.

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 > 4532

Encouraging production of healthy fatty acids in milk

The Institut National de la Recherche Agronomique (INRA) examined several different methods of encouraging goats to produce milk with elevated levels of conjugated linoleic acid (CLA).

The fatty acid CLA has been shown to have beneficial health effects in humans, improving resistance to a range of diseases. CLA is found naturally in meat and dairy products, especially milk.

Scientists with INRA joined a team comprising eight other research institutes aspiring to enhance the CLA content of milk. Considerable effort has already been devoted to cows, so the Biocla consortium turned its attention to goats.

INRA began by augmenting the goats' diet with C18 unsaturated fatty acids since these have been identified as a key driver of CLA production. Subsequently, the composition of the milk in the goats' mammary glands was studied, namely the relative abundance of certain fatty acids. This provided insight into the role of various lipogenic genes, such as LPL, ACC, FAS and SCD. The results indicate that lipogenic enzymes are just one piece of a complex puzzle of mechanisms in the case of goats.

A second phase of the Biocla research involved an *in vitro* approach using mammary explants from goats. The explants were treated with several different media in the laboratory and then subjected to a number of chemical analyses. The outcome was similar to that of the *in vivo* experiments, that is, the influence of fatty acid exposure on CLA production in goats is significantly less than that for cows.

INRA and its Biocla partners continue to examine the data in the hopes of further unravelling the CLA mystery.

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 > 4180

Gut bacteria make healthy trans fats

The health benefits of conjugated linoleic acid (CLA) are well publicised. Scientists are working on increasing its concentration in the dairy produce we consume. Taken as a supplement rich in trans fatty acid, CLA is claimed to confer many health benefits.

An antioxidant, CLA has been categorised as a good trans fat which confers resistance to atherosclerosis and cancer and reduces body fat retention. Natural sources include meat, especially lamb and beef, and dairy produce. Scientists working under the auspices of the Biocla project worked towards the overall objective of increasing the natural levels of the unsaturated fat in beef, sheep and goat products.

There is however another way of acquiring CLA and that is by using naturally occurring bacteria. These convert linoleic acid into the most biologically active isomer or form of CLA with the molecular signature of c9, t11. The bacteria capable of this conver-

sion include fermentation bacteria species like lactobacilli and streptococci. Moreover, bacterial inhabitants of the human intestine are able to generate CLA in this way.

Researchers at the State Department of Agriculture and Food Development (Teagasc) in Ireland, investigated the extent to which various gastrointestinal bacteria could convert linoleic acid to CLA. Probiotic bifidobacteria commonly used in yogurt manufacture to promote healthy gut flora, were investigated. Also under trial were probionibacteria found in natural skin flora.

Both types of bacteria were found to produce CLA, an added benefit being that the

isomer was mainly the required c9, t11. They found however that there were a lot of inter-species differences in respect to this trait. The team also worked on identifying more robust and technologically viable strains by isolating species from the human intestine itself. Babies, adults and elderly patients were studied to successfully isolate new efficient bifidobacterium species.

The data from this research could well provide the information for food technology to utilise the plethora of bacterial resources available in and on the body itself.

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 > 4428

Novel means for assessing early trauma and distress

A new approach to assessing early traumatic experiences and distress which may contribute to the development of psychotic disorders has been developed in the EU-funded EPOS project. Through early recognition and intervention in patients at risk of development of psychosis, the long-term socio-economic costs of psychotic disorders may be reduced.

The EPOS project was the first five-country prospective study to target untreated illnesses in early psychosis. The study predicted the transition to psychosis and the course of psychopathology for those who are at an increased risk of schizophrenia.

A multi-level assessment was conducted with outcome measurements taken at 9 and

18 months so that a risk profile could be established. Furthermore, methods of intervention such as psychotherapy or medication were monitored and the results were evaluated accordingly.

Following the review of the respective literature, the trauma and distress scale (TADS) was designed to assess early traumatic expe-

riences occurring in childhood and early adulthood in psychiatric samples.

Additionally, distress which may contribute to the development of psychotic disorders can be evaluated. Potential end-users are psychiatric, psychological or public health investigators engaged in psychiatric research.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4492

Phenological activity tables for oilseed rape pests

Crop protection strategies for oilseed rape currently rely on the use of pesticides. The use of phenological activity tables will allow for a more economic and environmentally friendly approach to pest control.

Oilseed rape is an important crop in the EU covering between 3.0-3.5 million ha, although this is expected to increase. At present, crop protection in oilseed rape relies upon multiple applications of pesticides, which can harm non-target species, reduce biodiversity and degrade the environment.

The Master project has developed economically viable and environmentally less harmful integrated pest management (IPM) strategies for the oilseed rape crop. This was

achieved by maximising the biological control of pests and minimising pesticide use. The Master project has developed phenological activity tables for six key pests of winter oilseed rape. The tables, which have been made available on a free-to-use basis, describe the influence of climate data on the activity of the pests.

The tables were used to incorporate phenological models for the pests into the decision support system (DSS) proPlant. They are also capable of incorporation into other

DSSs. Through the analysis of daily weather conditions, the systems can predict when the pests will become active and for how long.

By combining this information with existing models, farmers can be informed of the best time for applying pesticides, possibly at the beginning of pest migration. Research suggests very long periods of pest activity with several peaks of migration. If pesticides were to be applied not only at the beginning of migration, it would fail to target those pests which migrate later, because of the decreasing effectiveness of the applied treatment.

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

<http://cordis.europa.eu/marketplace> > search > offers > 4478

From little things big things grow

Arabidopsis thaliana is a small plant with a huge reproductive and genomic potential. Researchers have found small effect quantitative loci for increase in plant biomass within the Arabidopsis genome that could be utilised in other species.

Thale cress or *Arabidopsis thaliana* is a very popular subject for research. For example, the European Space Agency (ESA) investigated the effects of weightlessness on its cell cultures on the *Maxus 7* rocket. It is easy to cultivate and has a very short life cycle. As such, it is also a common model plant for genetic research and was one of the first plants to be sequenced.

Traits like growth rate are genetically complex and it follows that they are bound to be highly polygenic and affected by many small-effect quantitative trait loci (QTL). Previous to a study by Natural, an EU-funded project researching genetic variation in *Arabidopsis*, only the impact of large effect QTLs had been the focus of scientific attention.

Scientists at the Max Planck Society in Germany analysed a stretch of *Arabidopsis thaliana* DNA 1 centimorgan in length for genes

having an influence on plant growth. The length is significant because within this piece of DNA, recombination is less than 1 % likely. Consequently, there will be no separation of markers in that region and the sequence is therefore likely to remain intact.

Within this relatively small piece of DNA, the team found two small QTLs involved in growth rate. Interestingly for plant breeders, they both had a modifying effect on other genes and therefore could be viewed as highly epistatic. Moreover, one of the genes coded for a protein kinase, a growth regulator. This particular gene was found to actively maintain genetic polymorphism. The phenomenon of balancing selection has important significance for plant breeding in encouraging and maintaining genetic variability.

Only a fraction of the DNA potential for regulation of growth rate in *Arabidopsis thaliana* was analysed in this investigation. If this is typical of its genetic structure, thale cress is a possible source of great genetic potential to be transferred to crop plants with commercial viability.

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 > 4436

See also page 10 (Member of the cabbage family for dietary supplements)



New methods to protect from sour rot

Scientists might be closer to innovative measures against fungal contamination of grapes and wine across EU Member States.

The EU-funded 'Wine-ochra risk' project focused on the identification of those fungal species responsible for the production of ochratoxin A and ways to prevent their spread. The Agricultural University of Athens, a project partner, studied the *Aspergillus* species which causes sour rot in vines.

Research showed that the use of Switch, a chemical treatment containing fludioxonil and cyprodinil, can indeed suppress

Aspergillus-induced sour rot in affected plant species. The research team assessed the use of Switch treatment over two consecutive growing seasons and across two different geographical areas. Results provided evidence supporting Switch as an effective treatment against sour rot under the testing conditions and parameters.

Further study results indicated the suitability of specific chemical components against

sour rot fungal species as well as the best times for application of the treatments. It was also shown that fludioxonil was the more efficacious of the two active ingredients in Switch. These results can have a significant impact on plant breeding trials and agriculture companies.

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 > 4307

Gaining an edge in cystic fibrosis research

Research into the pathways involved and affected by cystic fibrosis (CF) is often hampered by the lack of state-of-the-art proteomics techniques that can analyse protein patterns at a cellular level.

The EU-funded Europrocf project addressed the need for advanced proteomics techniques in order to improve available research methodologies into CF. It is known that the impaired protein involved in CF is at the crossroads of a number of key pathways, which goes a long way to explain the severe nature of the disease in certain patients.

Europrocf project partners aimed to further develop the research tools available to the scientific community involved in CF

research, especially in the field of proteomics. The Institute of Biochemistry and Biophysics of the Polish Academy of Sciences developed software for the detailed analysis of 2D gel electrophoresis. The software, which is run on the Microsoft Windows operating platform, includes a number of innovative features providing key analytical insights.

One of these features is the ability to compare between two different gels and an

integral post-translational-modifications database, which allows for easier identification and on-the-spot comparisons. Further research into this area is likely to reveal key observations into the protein interactions in CF patients.

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

Collaboration sought: information exchange/training.

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Examining air pollution's effect on children

A report which combines the analyses of cross-sectional studies regarding air pollution's effect on children was created in an effort to improve assessment and better understand its long-term impact.

There is still much to be studied regarding the impact of air pollution on the young. However, the PATY project has delved into

moving this area of research forward by combining data and expertise from 12 studies related to air pollution and children's health. The size of the combined study covered results from over 67 000 children in 140 areas.

Respiratory diseases are of pivotal interest; therefore, the relationship of particulate matter and its combination with nitrogen dioxide (NO₂) and sulphur dioxide (SO₂) was examined in terms of respiratory symptoms and lung function. Furthermore, separate data such as socio-economic factors, smoking

and indoor air quality indicators were taken into consideration from each study in order to account for possible contradictions.

The studies that were chosen are very compatible regarding outcomes, pollution measures as well as other factors. The pollution data were carefully evaluated so that comparability of measures across areas was ensured. Also taken into account was the role of indoor air factors such as parental smoking and maternal smoking during pregnancy. It was found that adverse effects of parental smoking included asthma, wheeze, cough and bronchitis. Additionally household mould showed prominent adverse effects overall.

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

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Cod movements studied through otolith growth

Scientists studied otolith growth rates in cod populations in four ecosystems. The results provided information on the individual movements and seasonal distribution of cod populations.

Within their heads, fish possess structures called otoliths, which are sensitive to gravity and horizontal and vertical movement. Otoliths are made up of a gelatinous matrix containing particles of calcium carbonate. These structures accrete layers of calcium carbonate at a rate which reflects the growth of the fish. The result is that a cross-section of the otolith resembles tree rings.

Scientists can determine the age of the fish according to the rings and even estimate the rate of growth in some species. The age and growth rate are important for understating the timing and extent of spawning and the structure of the population. This information is necessary for drawing up appropriate management policies for fisheries.

Researchers from the Codysey project used the information gained from otoliths to understand the horizontal and vertical movement of cod and the influence of environmental factors. This enabled scientists to predict the individual movements and seasonal distributions of cod stocks. Although daily changes in cod otoliths can be identified in fish below five years old, it was not possible to identify daily increases in adult cod.

However, results did show that the annual change in otolith patterns clearly differed between cod populations from the southern and northern North Sea. This allowed fish from each region to be distinguished. A decrease in opacity was observed in otoliths in cod from the Baltic Sea and the

Faroe plateau as they changed their behaviour from feeding to spawning. This suggested that otoliths could be used as a reliable indicator of spawning events in cod from these regions.

The otolith accretion model was applied to tagged individuals from the Baltic Sea and North Sea. The structure of the otoliths was compared with actual observations of the tagged individuals to identify the factors which affect accretion between different ecosystems. The modelling of these structures used environmental data from each ecosystem to identify the movements of individual cod. This information was used to gain a greater insight into population processes, resulting in improved fisheries management.

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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Toward more socially responsible energy production

In order to meet the social responsibility challenges faced by the oil and gas industry, initiatives and recommendations were set up aiming toward a more sustainable and efficient energy supply.

As part of a thematic network under the Fifth Framework Programme (FP5), the Trends-2 project aimed to meet European demands for sustainable, secure, safe and clean energy supplies. This involved the recognition and examination of significant challenges in the fields of quality, health, safety and environment. Stakeholders, decision-makers, operators and suppliers, including small and medium-sized enterprises (SMEs) and universities were brought together equally to face present and future challenges in these fields in relation to hydrocarbon energy production.

A segment of this effort revolved around the notion of social responsibility and more specifically, the industry's tradition and

goals in regards to corporate social responsibility (CSR). The oil and gas industry was among the pioneers in CSR involvement and seeks total integration in daily business exchange. The management of CSR is beneficial as it equates to good risk management and supports both brand value and financial credibility.

In relation to CSR, the oil and gas industry faced many hurdles. For instance, since it is an industry with great diversity in terms of its implementation, it was found that CSR is not properly formed throughout the entire supply chain. Furthermore it was discovered that although environmental reporting is well established, the same does not hold true for social performance. Since modern society is one of information and knowledge distribution, the public no longer accepts companies' closed door policies.

In order to fill the gaps, meet the challenges and create the awareness necessary, several recommendations were considered. One of these involved learning through sharing of both successful and less successful cases. It was also suggested that reporting requirements become more locally relevant. The need for improved performance evaluation and increased stakeholder involvement were also taken into account.



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

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

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Web service links leading solar radiation databases

The SoDa service has been created with the aim of developing solar radiation databases for environmental monitoring. This is now an operational service for which the successes have gone beyond the original plan.

The solar energy research community needs to be supported in its efforts to find solar energy systems which are more efficient and cost-effective. It is expected that when this happens there will be a visible shift to the use of this type of renewable energy.

The Heliosat-3 project provided solar radiation data gained from the exploitation of advanced Earth observation technologies. It established a prototype service for retrieving surface solar irradiance information. Components include retrieval algorithms for the estimation of parameters in the atmosphere that change radiation transfer like aerosols and ozone. There are also calculation schemes for solar irradiance based on retrieved atmospheric parameters and calculations of the additional parameters relevant for solar energy applications. Furthermore, the project implemented an operational processing chain from Meteosat data for the ultimate application of oriented solar radiation data.

Within this project the SoDa service evolved. This service links the world's leading solar radiation databases via one website. It integrates diverse sources of information previously only available separately and allows it to be accessible within a smart integrating network. It therefore has increased the quality of the delivered information by matching the information availability to satisfy consumer needs. The web interface was extended to integrate the climatological operational chain at École des Mines de Paris and Oldenburg University, which provided web access for the irradiance products to the consortium.

Some vital research areas such as climate change studies, solar electricity

production and human health studies have already benefited from the service. The project continues to bring unexpected benefits such as creating new business, improving upon web technology and turning over a profit.

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

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

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Reliability standards push the energy industry forward

The Trends project brought together oil and gas companies, contractors, suppliers, universities, NGOs and other stakeholders. The purpose was to promote the continuous improvement in quality management and reliability standards.

Trends researchers were concerned with developing quality and reliability standards in order to encourage a more sustainable energy sector. Detailed evaluations were conducted on international standards at work in the oil and gas industries, as well as looking at how they are applied by companies. This study took an integrated approach to the development of quality standards in order to make them more comprehensive, relevant and ultimately advanced.

The researchers involved developed a work package which led to an assessment of the

industry as a whole. Through workshops and discussion groups they were able to pick out the most important topics for analysis and make recommendations.

The project distinguished the major factors to be taken into consideration when discussing established standards. Research highlighted that reliability is of major importance for the oil and gas industry, especially in the offshore sub-sea sector. Here, the cost of interventions to replace or repair critical failures of components of sub-systems

is very high. Therefore much attention was paid to the development of an improvement strategy.

Recommendations were made as a result of further observations. These focused on design improvements, how to ensure the quality of the system, in particular through the integration of health and safety aspects in order to achieve lower costs and improve overall effectiveness in operations. It was suggested that online condition monitoring for early prediction of failures be implemented.

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

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

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Examining the energy industry's environmental impact

Measures were taken toward a closer look at the European energy industry in order to obtain better risk management and to minimise future environmental impact.

The Trends project sought to promote continued improvement of the European energy industry toward sustainable development. The main focus was placed on environmental impact. This is an area which operates within a constantly changing framework, as activities and projects that companies undertake, demands for renewable energy and location of accessible resources are all in constant flux. Additionally, science continues to advance in terms of understanding environmental

impacts and how the cause of such risks can be minimised.

In the process of analysing the priorities of the offshore energy industry's environmental performance for the future, the Trends project achieved two major goals. One is that it has defined the highest level of environmental risk management practices taking place in offshore energy industries. The other is that it has pinpointed crucial areas where more sophisticated

means are called for and how those means can be put into practice.

The particular areas for improvement which were highlighted were assessment, management and reduction. Overall this involved knowing the impacts and how they can be measured, obtaining integrated models and decision support systems and creating technologies which may help to minimise exposure. Following this, necessary actions and follow-up procedures were addressed.

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

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

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Calculating wind variances for better performance

Highly variable wind conditions present considerable complications in running wind-turbines effectively. Changing wind speeds or directions require suitable responses in the turbine's blade speed, pitch or yaw. Under the auspices of Conmow, an EU-funded project, new algorithms have been developed to analyse and assist in responding to these changes.

Changes in wind speed and direction can play havoc on wind turbines if left unchecked. Not only can they adversely affect their optimal performance, they can also impact their longevity. If the wind is too strong, for example, the turbines have to be shut down. Turbines are carefully balanced instruments, requiring constant monitoring to ensure optimal conditions and these algorithms provide suitable means by which these can be achieved.

The algorithms are capable of functioning both on a predictive and on an immediate response basis. They do so under two main headings; medium and low frequency.

Medium frequency operates at the 30-32 Hz range and analyses the power signal by means of wavelets and fast fourier transforms (FFTs). With the use of these algorithms the generator shaft misalignment could be detected by simply looking at the generator slip frequency. More specifically, fine details in the electric power signal provide valuable information on changes in the generator flux field during periods of increased vibrations.

Low frequency analysis uses data from supervisory control and data acquisition (SCADA) systems to assess temperature

signals over time and improve the quality of failure detection. This determines any possible faults that might occur in the bearings, pitch, yaw, anemometer and controllers.

The research was intended to benefit project partners in improving their ability to monitor offshore wind farms remotely and is directly related to research looking into automated surveillance systems beyond the scope of the Conmow project. On the other hand, the developed algorithms are readily applicable to wind-driven generators and can improve their ability to function under a wide range of wind conditions by contributing to pro-active and predictive maintenance efforts.

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

Collaboration sought: further research or development support.

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Improving sensor arrays for better oceanic understanding

To determine the variability of heat fluxes in fresh water flows between the North Atlantic and Arctic Ocean, an innovative design of observation arrays had to be developed. The ASOF-N project set out, as one of its objectives, to formulate the required observation tools and locations to do so.

Studying water flows in some of the world's most hostile environments, requires considerable effort. Not only do developers need to consider the extreme weather conditions, they require a number of observational and measurement tools. Moreover, these need to be cost-effective and ultimately provide readings that are more accurate than previous systems.

Various system modifications were implemented. There were design changes made to the observation arrays in the Fram Strait and Barents Sea opening and newly developed instruments were installed in the moorings. Additionally, to augment the observation moorings, hydrographic stations were designed to retrieve the spatial variability of the Atlantic water pathways. Pop-up

buoys were tested for the near-real time transfer of data through all weather conditions.

Other key measurements were also conducted using various implements. Bottom pressure recorders, and inverted echo sounders with pressure sensors were used to estimate barotropic currents as well as heat content. Tube moorings combined with acoustic Doppler current profilers were used on the shelf of the Fram Strait.

Whilst this list is not comprehensive, they, and the other developments implemented, successfully contributed towards improving the accuracy, range and coverage of data in key areas. They in turn, improved the estimates of oceanic fluxes due to more reliable measurements in these key locations at greater resolution. Subsequently, better model validation and improved ability to predict environmental conditions were attained.

While further development will continue, the results of the project can be used by a wide variety of interested parties. These include scientists who have a direct involvement in Arctic or oceanic studies to companies expressing an interest in novel oceanographic instrumentation, environmental protection agencies and fisheries.

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

Collaboration sought: further research or development support.

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Past levels of acidity and CO₂ concentrations in the atmosphere of the western Pacific

It is known that the world's oceans play a key role in limiting carbon dioxide (CO₂) levels in today's atmosphere. Scientists are now trying to understand how this role may have varied in the past in order to better understand the effects of climate change in the future.

The atmospheric concentration of CO₂ concentration has a major influence on the Earth's climate. Studies have revealed that atmospheric CO₂ levels were lower during glaciations than in inter-glacial periods. Work by the 6C project demonstrated that the equatorial Pacific Ocean was an important source of CO₂ to the atmosphere around 14 000 to 16 000 years ago. This was a time characterised by a rapid rise in atmospheric CO₂ and the warming of the Earth's climate.

The 6C project partners measured boron isotopes in the foraminifer *Globigerinoides*

sacculifer, a type of plankton, to determine the acidity (pH) of the seawater. Once this information was known, the level of CO₂ in the water could be calculated. Researchers studied samples of *G. sacculifer* from between 400 to 23 200 years ago.

The results indicated that the CO₂ in surface waters for this area of the Pacific Ocean were usually in equilibrium with atmospheric CO₂. However, between 13 800 and 15 600 years ago the level of CO₂ in the surface water was around 100 parts per million higher than atmospheric levels. This suggested a period of more frequent upwelling,

which brought nutrients and CO₂-rich waters to the ocean's surface. These conditions were a result of intensifying conditions of the cold pool in the eastern Pacific and the strengthening of the trade winds.

The results from the 6C project demonstrate that studies using planktonic foraminifers are an extremely useful tool for investigating variations in ocean-atmosphere CO₂ exchanges. This technique was used to identify past sources and sinks of atmospheric CO₂ and increases our understanding of the atmosphere's sensitivity to changes in CO₂. This in turn helps scientists studying climate change to better understand the role the ocean plays in controlling atmospheric CO₂.

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

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

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Modelling the carbon cycle in oceans with Medusa

A new ocean sediment model was used to validate scientific theory regarding substantial shifts in levels of carbon dioxide (CO₂) in the Earth's atmosphere in the distant past.

The 'Model of early diagenesis in the upper sediment (A)' (Medusa) was created by scientists at the Université de Liège, Belgium. Medusa is a one-dimensional model that accounts for advection, diffusion and chemical reactions for carbonates, opal and organic matter. Two sediment phases, solid and pore-water, are defined for two different layers: the reactive mixed layer and the historical zone below it.

In the context of the EU-funded 6C project, Medusa was coupled to the 'Multi-box

model' (MBM) ocean model to study the impact of the ocean mechanisms on CO₂ concentrations in the atmosphere (pCO₂). The reduction in the ratio of organic carbon to carbonate carbon, known as the rain ratio, during the last glacial maximum (LGM) and the corresponding drop in pCO₂ were, in general, well reproduced.

A phase shift was identified in the sediment record simulated by Medusa. In particular, the depth of the modelled calcite transition zone (CTZ) increases during the LGM while

actual sediment samples reveal shrinkage. The Université de Liège believes that dissolution of the reactive mixed layer could be the key to resolving this discrepancy.

Medusa represents a significant improvement over previous, overly simplistic sediment models. In addition to its speed and flexibility, Medusa also boasts bi-directional vertical transport, which constitutes a much more realistic picture of reality on the ocean floor. Palaeoceanographers stand to benefit significantly from this development.

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

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

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Alcohol index reveals deep ocean secrets

Valuable insight into the formation and movement of deep sea water masses has been obtained through the use of an alcohol index created by Spanish paleoceanographers.

Growing concern over climate change in Europe has triggered increasing interest in the North Atlantic Ocean. In turn, FP5 has funded a considerable number of measurement campaigns aimed at improving our knowledge of this important body of water.

One such project, entitled Pacliva, investigated aspects of climate variability using a proxy based on hydrocarbon concentrations in cores obtained from deep sea drilling. More specifically, researchers with the Institute of Chemical and Environmental Research in Spain came up with an alcohol index (AI) that corresponds to the relative fraction of alkanes to alcohols in the sample.

In addition to monitoring changes in vegetation, the Spanish scientists learned that

the AI could also provide important information about deep water currents. The AI was subsequently calculated for cores from the North Atlantic (MD952011 and ENAM9606) and a core from the Gulf of Lions in the north-western Mediterranean (MD992343).

The results of the analysis reveal relatively constant deep water flows in the North Atlantic since the start of the Holocene 10 000 years ago. On the contrary, deep water currents have been much more variable on the floor of the Mediterranean. For example, the AI calculated for MD992343 dropped dramatically approximately 7 300 years ago, recovered for a time but has recently started declining again.

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

Collaboration sought: further research or development support.

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Ensuring environment quality status for European lagoons

The aquatic ecosystem of southern European lagoons needs to be supported by local and national governments. A new decision support system designed as part of an EU-funded project has created an IT tool which can aid with the selection of techniques and actions taken to ensure sustainable lagoon ecosystems.

The European Water Framework Directive entered into force in 2000. In line with this directive, management of southern European lagoons needs to ensure that there is a good environment quality status.

The DITTY research project was geared towards developing sustainable marine

ecosystems. In particular, case studies were conducted on southern European lagoons. The scientists employed different kinds of analytical and mathematical tools to develop a system which would support the decision-making process of local and national authorities when managing lagoons under the influence of river basin runoff.

The information technology tool as it has been designed is able to simulate and emulate the effects on the lagoon ecosystem. It analyses factors such as lagoon fluid dynamics, river runoff influence, nutrients' cycles, shellfish farming and macro-algal blooms.

What characterises the DITTY decision support system (DSS) is its flexible structure. It has been designed in such a way, to be able to adapt to problems of varying degrees of complexity. This has been made possible because the case studies were carried out in different locations across southern Europe. What this meant in effect was

continued on page 21

Improving resource management of lagoons in the Mediterranean

As part of DITTY, an EU-funded project, research contributed to the study of available resources in southern European lagoons. The Mar Menor site in Spain provided the conditions for scientists to develop information tools tailored to these types of ecosystems.

Mar Menor is the location of one of the main coastal lagoons in the Mediterranean. It is also the site for an important study which was conducted by European scientists for the DITTY project. The project aim was to study the watershed and to apply appropriate methods to reduce the nutrient loads in the lagoon.

The team gathered information on the climate, physico-chemical, biological, hydrological and socio-economic conditions of

Mar Menor, which was compiled into a database. Using this information, the team set to work and developed a scientific and operational basis for a sustained and rational utilisation of the available resources. A hydrological model was specifically developed for the Mar Menor watershed. The results also encouraged a closer integration among institutions, policies and administrative units.

For the end-users, the water management institution, the regional office for the enviro-

nement and the city council, the research was very useful. It revealed the different perceptions and preferences of different social sectors regarding the main available options and scenarios for the Mar Menor site. In the case of the Water Management Office, these perceptions supported the priority they had given to reducing nutrient loads in the lagoon. The application of a decision support system proved particularly useful for the city council.

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

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

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Effect of elevated CO₂ on nitrogen uptake in poplars

Experiments were designed to help researchers understand the effect of increased levels of carbon dioxide (CO₂) on the biosphere at the ecosystem level. The Euroface project studied how raised levels of CO₂ affect nitrogen (N) uptake from soil.

Tree growth is usually controlled by the availability of N. When plants are exposed to increased levels of atmospheric CO₂ they frequently show an increase in growth and biomass. Over the long term this can result in more N being taken up from the soil environment.

Euroface studied the use of N in trees of three different species of poplars within a plantation. The trees were exposed to free air-CO₂ enrichment (FACE) and harvested at the end of the three-year rotation cycle. The trees were then analysed to discover whether use of FACE had influenced the future N availability for the plantation. The long-lived woody material was used to determine N concentration and N content. The N uptake of tissue with a fast turnover, such as fine roots and leaf litter, was measured through the entire rotation cycle.

The experiment revealed that despite higher productivity, N uptake by the different species of poplar trees did not change under

raised levels of CO₂. This was in comparison to normal background levels. As a result N use efficiency (NUE) increased under raised CO₂. This did not support the idea that additional N was needed to maintain greater carbon uptake under raised CO₂ in the plantation. However, a major decrease in soil N was revealed under raised CO₂ conditions following the end of the rotation cycle compared to CO₂. This was most likely a result of decreased input by leaf litter and decreased decomposition rate.

Researchers also noted a trend, albeit

not significant, of increased N immobilisation under raised conditions of CO₂. This could result in limiting conditions of N availability over the longer term. This might possibly affect the productivity of poplar plantations over multiple rotation cycles.

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

Collaboration sought: further research or development support.

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continued from page 20 'Ensuring environment quality status for European lagoons'

that the results produced were subject to differing geographical and socioeconomic contexts. Therefore the designed system was able to account for the effects of different agricultural, urban and economic activities and how these factors influence the aquatic ecosystem.

The DITTY DSS provided a valuable contribution capable of being applied to contexts outside of the project domain. What this has meant is that although initially directed at Mediterranean lagoons, the DSS structure can be applied to all types of coastal lagoons, such as those in the Baltic, Black and North Seas.

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

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

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When disaster strikes

When disaster threatens, the first hours are crucial. European researchers have developed an automated system to provide early detection, forecasting, and warning of natural disasters such as floods and wildfires.

Floods, forest fires, and other natural disasters take lives, harm the environment, and cause billions of euros of damage every year — EUR 50 billion worldwide in 2007 alone. The EU-funded programme 'Sensor and computing infrastructure for environmental risks' (SCIER) took on the challenge of developing a state-of-the-art automated system to detect disasters in the making, forecast how an emergency is likely to unfold, alert authorities, and get them the information they need to respond effectively.

'We can provide public authorities with real data and predictions in real time,' says Sotiris Kanellopoulos, the project's technical coordinator. 'So the public services can coordinate their forces and manage the emergency in an efficient way, and people who live close to forests or rivers can protect themselves.'

The first level of the group's solution is to deploy networks of ground-based sensors such as video cameras, meteorological instruments, and river-level gauges in high-risk areas, especially the 'urban-rural interface', where homes and businesses lie close to undeveloped terrain.

The ground-based sensors are linked wirelessly into what the researchers call a local area control unit. This level of the system structures and compares the raw data, for example checking to see if a temperature spike at one sensor is matched by similar changes at nearby sensors. 'The system should be able to understand when there is a false measurement,' says Kanellopoulos, 'so it can filter out what is unrealistic and not trigger a false alarm.'

When the local area control unit decides a threat is real, it activates the next level of SCIER's computational armamentarium to forecast how the emergency is likely to develop during the crucial first hours. 'We don't claim that we can simulate a fire disaster for days,' says Kanellopoulos. 'But we can simulate it for the next few hours.'

The researchers have implemented sophisticated mathematical models of how natural disasters unfold. Those models include detailed information about the local geography, plus real-time sensor data concerning wind, rainfall, temperature, and other variables.

They found that, in order to produce meaningful forecasts, they need to generate multiple simulations of a disaster. Only then can their models provide authorities with accurate and useful information, such as where a wildfire is most likely to threaten homes.

'We generate different scenarios using different wind speeds, directions, and other relevant parameters,' says Kanellopoulos. 'Then we score each scenario and try to filter out scenarios that are unrealistic.'

The system uses the most likely simulations to generate detailed maps that authorities can use to manage the emergency. 'The simulations are visualised on a reference map, so the public authorities can see in a very direct way what is going to happen in the area for the next two or three hours,' says Kanellopoulos.

Generating these complex simulations in real time demands enormous

amounts of computing power. SCIER relies on the GRID to provide that computational clout. The GRID, sometimes known as the next-generation internet, is a dedicated network that links thousands of computers via a fibre-optic network that is up to 10 000 times faster than the internet. It allows researchers to perform calculations that could not be done otherwise. 'Because we need to run a vast amount of calculations in real time, I don't believe that a single core computer could compete with the GRID,' says Kanellopoulos.

SCIER, funded by the Sixth Framework Programme (FP6), already has a functioning trial network in the Czech Republic, aimed at managing floods. The next trial is taking place near Athens, Greece. It will test a sensor network, local area control unit, and higher-level computational resources for detecting and controlling forest fires. A third trial is scheduled to take place in France.

Kanellopoulos says that the group's greatest technical challenge was in combining research and technological capabilities from different areas, for example ways of generating and presenting geographic information using the GRID.

However, he adds, SCIER's greatest achievement will be seeing the system applied 'on the ground' to help authorities protect lives and property from natural disasters. 'It's the result that is important — an overview of the event so public services can coordinate their forces and manage an emergency in a more efficient way.'

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Seismic risk assessment of the Dead Sea fault

The Middle East has been hit by strong earthquakes in the past. A palaeoseismic investigation funded under the INCO 2 programme will help quantify the risk associated with possible future events.

The Dead Sea fault (DSF) is an important strike-slip fault that cuts across several countries in the eastern Mediterranean. It was the subject of intense research during the APAME project, which brought together experts from the region as well as from several EU Member States.

Turkish geologists with Eskisehir Osmangazi University (OGU) used a variety of techniques to study the DSF during APAME. For example, field observations in their native country as well as in Jordan, Lebanon and Syria helped establish distinct fault segments. Palaeoseismic and archaeoseismic analyses were performed at specific sites, leading to the production of detailed topographic profiles and digital elevation models (DEMs).

In addition, OGU populated the APAME seismicity catalogue with information for significant events stretching several seismic cycles into the past. For instance, core samples revealed that three major earthquakes have struck the region where the Al Harif Roman aqueduct is located over the past 2 000 years.

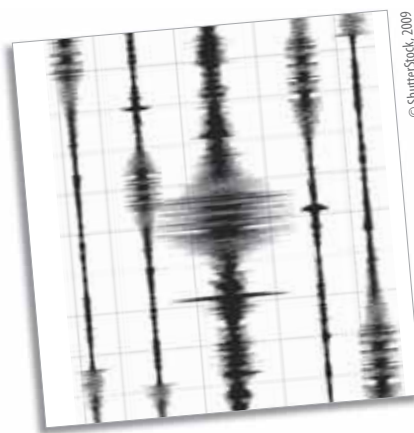
Advanced remote sensing techniques, such as ground penetrating radar and magnetic prospecting, were used to profile various sections of the DSF, shedding light on displacement from significant events. Finally, in a cooperative effort with other research institutes, a dense global positioning system network was installed. The data collected have enabled more accurate measurements of the slip rate at different points along the DSF.

The knowledge acquired during APAME will be exploited to produce improved seismic risk assessments for cultural heritage sites in the region.

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

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

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Algae and herbivores combat eutrophication

The National Centre for Mariculture of the Israeli Oceanographic and Limnological Research Institute advanced the algae-herbivore biofiltration concept for the sustainable management of fish waste from aquaculture installations.

Aquaculture is an increasingly important part of Europe's prominent fishing industry. Fish farm effluent, however, can negatively impact local water quality and often causes eutrophication. Marine scientists from Europe, the Middle East and China combined their talents to design an ecologically sound solution.

Working with funding from the INCO 2 programme, the Zafira project participants introduced algae, specifically the diatom *Navicula lenzii*, to fish farms to remove nitrate and phosphate. Performance was optimised by applying a sequential-batch

culture system in which the harvest cycle was adjusted according to the time of year. Diatom production was further enhanced by adding silicate, iron chloride and sodium hypochlorite to the tank.

Measurements indicated significant uptake of nitrate and phosphate by the algae, though not all sequestered nutrients were subsequently retained. In the next phase, brine shrimp (*Artemia salina*) consume the diatoms. The National Centre for Mariculture and its partners obtained the best results indoors, as indicated by specific growth rates, nutrient retention and food conversion rates.

The experience acquired during Zafira highlighted specific challenges that must be addressed in order for such systems to become operationally feasible outdoors. For instance, sufficiently large volumes are required to produce the necessary amounts of algae. In addition, other filter feeders, such as oysters and abalone, could be the key to boosting nutrient removal and need to be investigated.

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

Collaboration sought: information exchange/training.

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See also page 12 (Recycling waste from fish farms)

Following carbon paths in the ecosystem

Undoubtedly, climate change has a significant effect on ecosystems globally. Understanding these effects is the topic of studies which need specific experimental infrastructures to unravel the underlying complexities involved.

The EU-funded Euroface project employed a known technology (FACE) to study the role of forest plantations as mitigators of the effects of greenhouse gases. Also, project partners sought to quantify the uptake of carbon (C) by soil (and subsequent storage) during climatic change conditions.

Partners examined the effect of litter on C sequestration in soil; litter decomposition is considered one of the key processes affecting C

exchange between atmosphere and the terrestrial biosphere. Researchers tested the hypothesis that elevated CO₂ and soil nitrogen (N) availability can influence just how much C is lost by decomposing litter. Leaf litter enriched with carbon isotope ¹³C was incubated over a period of 10 months under controlled conditions in natural and N fertilised soil conditions.

Results showed that soil was enriched with ¹³C at a depth of up to 5 cm in the tested

areas where litter was left to decompose. A lot more C was transferred to soil as compared to that released to the atmosphere as CO₂. The results indicate that most C from leaf litter enters the soil as fragmented pieces of litter.

Further insight into how above-ground litter can affect C sequestration is needed in order to shed light on this extremely important aspect of the carbon cycle.

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

Collaboration sought: further research or development support.

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Markers identified for metamorphosis in halibut

The AARDE project has developed markers that can be used to monitor the development of Atlantic halibut from the larval stage to juvenile fish. This allows the quality and quantity of fish being produced to be reliably controlled.

Flatfish such as halibut, turbot and sole play an important role in the diversification of European aquaculture. However, production has faced problems with the successful rearing of larvae. One such challenge involves failed metamorphosis. Metamorphosis in flatfish is associated with the change from a free-swimming symmetrical larva to an asymmetrical bottom-living juvenile. Another feature of metamorphosis is that one eye migrates from one side of the head to the other.

The AARDE project identified reliable markers which acted as indicators of the progression of metamorphosis in Atlantic halibut. Furthermore, the markers were able to differentiate between different stages in the life cycle and between normal and abnormal metamorphosis. Both molecular and morphological markers were identified, which changed between pre-

metamorphic larvae and post-metamorphic juveniles.

Although the markers were developed for Atlantic halibut in particular, it is intended that they should be applied to flatfish in general. However, this will require further testing. Markers for diagnosing abnormal metamorphosis were difficult to find and need further validation.

The creation of a tool for improving the quality, health and predictability of fish larval production is extremely valuable to the aquaculture industry. It helps in the sustainable production of high-quality fish for the consumer



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and in providing jobs in remote rural areas which have only limited employment.

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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Tourism gets decisive support

Modern rural tourism is an integration of environment, capacity, stimulation, resources, community and even products. For such interwoven interests, a decision support system (DSS) has been developed to ensure maximum benefit is gained through optimal use.

Tourism can be both a blessing and a curse in certain situations, whereby an influx of tourists can overstrain and negatively impact both the environment and resources of a region. However, its blessings can be enormous in stimulating the economic growth of regions and communities. To this end however, proper tools are needed to support and identify related issues.

The DSS developed under an EU-funded project, Sprite, describes the possible forces involved that influence potential tourism

actors. The tool even considers potential hypothetical events and the context of such events. An example of this could be a sudden worldwide interest in a recent archaeological discovery. The DSS is capable of simulating the effect of decisions within the different hypothetical events and the various actors involved. In total, 15 scenarios were developed for the DSS, two of which were base scenarios, the remainder being alternatives. The base scenarios were used to identify changing perceptions, planned actions and the expected policy requirements. The

remaining scenarios deployed work on a predictive basis, identifying future potential policy requirements based on the hypothetical decision-making logic of the software.

The DSS can undoubtedly be further exploited as a decision-support tool and a base for modelling within the field of integrated tourism. However, the system required further development as far as the source input was concerned as it was unable to accept textual data, making it dependant on structured numerical data only.

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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Cormorants demand new legislation

Ecosystems and their wildlife are all interrelated and connected. Our governmental bodies need to accommodate this fact in any conservation policy. As such, thanks to an EU-funded research project, FRAP, a new governmental body is now in place to better coordinate man's activities relating to ecosystem exploitation and sustainability.

An old expression, 'kill a beetle to starve a bear' expresses how each part of an ecosystem has a direct and important link to one another. In a similar manner, research has shown that passing laws on one aspect of the environment without considering its impact on other facets of the situation may not be the best thing. Legislative bodies must

therefore consider and tackle the problem from all sides.

The new governmental body established refers to and incorporates members from a wide variety of activities and interests. These range from hunters, anglers, ornithologists and animal welfare and local managers, to

name a few. One such example of their activity involves the cormorant — a large, dark-coloured long-necked seabird. By nature the cormorant is a voracious animal, greedily eating everything it finds. The impact this species has on the food chain is enormous and, being both a land- and sea-based creature, any legislation affecting it had to be carefully assessed.

For the land conservationist the cormorant presents a particular problem as they nest in cliffs or trees, the latter being destroyed by the cormorant droppings. For fisher-

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Floating van measures traffic emissions

A new mobile laboratory developed by an Italian research institute proved to be up to the task of monitoring air quality on the busy streets of Europe's major cities.

Road traffic is a major contributor to air pollution in urban areas. The Miracles project, funded in part by the Growth programme, implemented a number of measures to reduce traffic emissions in a number of cities. One of the challenges the research consortium faced was how to determine whether or not the initiatives had any positive impact on air quality.

The answer came from Ente per le Nuove Tecnologie, l'Energia e l'Ambiente (ENEA), a Miracles participant from Italy. ENEA outfitted a van with special monitoring equipment capable of collecting data while travelling at high speeds. The van was used to gather information about harmful particulate matter (PM) concentrations of varying sizes (PM10, PM2.5 and PM1) and traffic data (e.g., vehicle speeds).

For example, ENEA found that fine PM levels in Rome, a Miracles pilot city, were

reduced by 8–12 % after an electric bus line was introduced. Efforts were made to limit the influence of varying weather and traffic conditions during the analysis. The data collected with the so-called 'floating van' were also used to improve the TEE (transport, energy and environment) traffic emission model, which is part of the Ishtar software suite.

Further to the successful deployment of the van during Miracles, ENEA is looking to expand its array of air quality analysers to address other pollutants, such as nitrogen oxides, ozone and benzene. Another planned improvement is the installation of glo-



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bal positioning system (GPS) hardware. In the future, ENEA hopes to collaborate with the Italian authorities to further exploit the van's potential.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4467

Diminishing traffic caused by loading trucks

Traffic congestion is a major problem in inner city zones all over Europe. The Tellus project set out to tackle this by providing an efficient solution to the traffic caused by distribution vehicles such as freight trucks.

Distribution vehicles can always be spotted clogging up many roads in busy inner city zones. Truckers and truck owners maintain this is all part of a day's work, much to the dismay of frustrated commuters.

The inner city of Gothenburg in Sweden is already an environmental zone. It is therefore the ideal testing ground for a new scheme set up by European researchers to reduce the problems caused by the loading and unloading of trucks in the city. This is made possible by providing truck owners with the right incentives.

This scheme started with eight distribution vehicles armed with a special GPS instal-

lation to record their action in the inner city. Measurements were recorded on the current loading rate, distribution routes and number of stops made. During the second part of the project, an electronic pen was designed which was able to record information electronically regarding the increased loading and stopping behaviour and its effects. Once this information was collated and analysed, the team worked with the authorities on incentives to speed up the loading rate, such as creating designated loading zones and the use of public transport lanes.

The main result has been to demonstrate how much accessibility incentives are

helping to improve the loading rate and traffic congestion in this inner city zone. It is expected that if the suggestions are implemented, then a reduction of vehicles operating in the area will be visible. In turn, this will mean a reduction in emissions of nitrogen oxides, sulphur oxides and particulate matter. This can promote dynamic development in support of sustaining environmental zones in the inner city.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4311

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men, the cormorant is often seen as a threat, due to their ravenous appetites. Preserving the balance between cormorant, the fishing industry and woodland habitat as well as ensuring sustainability is a matter that involves all three elements.

The new legislative body, in consulting with all stakeholders and interested parties, intends to formulate effective laws that not only ensure everyone's interests, but also

preserve the environment. Doing so, it will help to provide effective cormorant management in the future.

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

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

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Impact of historic climate variation on Arctic sea ice

Establishing a better understanding of the long-term effect of global warming on the Arctic Ocean is of central importance to researchers and governments all over the world. The Greenice project, which examined sediment cores from the Arctic seabed, revealed new data on the conditions which were present over the last two glacial and interglacial cycles.

From an ice camp located near to arctic Canada, scientists investigated the properties of sediment cores and the long-term climate variability. The Lomonosov Ridge, which faces the Lincoln Sea, had not previously been explored. In this uncharted territory, the scientists studied the structure and dynamics of the sea ice cover.

The sediment cores under examination were found to contain calcareous microfossils. The samples were examined and they were able to establish a reliable age of the area. The analysis brought to light new data on variable palaeo-oceanographic conditions of the Arctic over the last 2 million years.

The main finding was that the heavily ice-covered area under study, actually underwent long periods of reduced ice in previous warm periods. This result is particularly significant for testing climate models of Arctic Ocean conditions in respect to global warming. These results have been published in peer-review scientific journals.

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 > 4416

Heat flux in Fram Strait affects Arctic climate

Imported oceanic heat entering Fram Strait from the North Atlantic could affect ice cover in the Eurasian Arctic, and be released to the Arctic atmosphere. Therefore, measuring heat flux through the strait is vital to understanding the climate of the Arctic, which is closely linked to that of Europe.

Fram Strait is a deep-sea channel connecting the Arctic Ocean and the Nordic Seas. Lying between Greenland and the Spitsbergen Island, it represents the main point of entry for warm water from mid-latitudes to the Arctic Ocean. Heat flux has been measured in this area for over 20 years by a series of moored instruments. Researchers from the ASOF-N project have continued this work. They have monitored the changes in temperature and velocity of water passing through the strait in an attempt to understand how it varies over time.

Since 2001, measurements of heat flux have been complemented by acoustic doppler current profiler (ADCP) recordings. These have been taken by research vessels which have delivered highly-detailed information on temperature and velocity. Hydrographic measurements have also been taken

to determine heat flux. The combination of these three observational methods, which had never been published before, allowed the most accurate estimates possible to be made for heat transport.

The current of warm water through the Fram Strait splits into various branches which travel northward and eastward or recirculate immediately back into the strait. The size and strength of these different branches need to be determined as they affect the amount of oceanic heat entering the inner Arctic Ocean.

The likelihood of error was considerably reduced by the research team who deployed additional moorings in the central part of the strait. Improvements to the Alfred Wenger Institute's North Atlantic-Arctic Ocean-Sea Ice Model (Naosim) enabled the different

branches of warm water to be represented more realistically. The models employed meteorological data, simulating its impact on sea ice, currents, temperature and salinity in the ocean. Close agreement between the model and estimates based on observations from Fram Strait have enabled the ASOF-N team to relate changes in the channel to large-scale oceanic developments.

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

Collaboration sought: further research or development support.

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Reducing the cost and impact of environmental tracers

New low-cost, low-impact airborne and waterborne tracers and detection methods have been designed for use in oil exploration.

Conventional tracer species are associated with a range of negative environmental impacts, including stratospheric ozone depletion, climate change and ecosystem degradation. For this reason, the EESD programme funded research to develop novel, environmentally benign tracers.

The Institute for Energy Technology (IFE), a member of the Envitracer consortium, examined ways to reduce costs. They focussed on deuterated organic compounds in which

hydrogen atoms are replaced by deuterium. By relaxing purity constraints, IFE was able to achieve significant gains in tracer productivity through partial deuteration.

Airborne tracers were constructed from deuterated alkanes derived from decarboxylation of deuterated organic acids while waterborne tracers were produced from deuterated fatty acids. Testing by IFE indicated ample levels of reservoir stability.

This was complemented by parallel efforts to improve the accuracy of the analytical techniques used to determine tracer concentrations, such as gas chromatography-mass spectrometry (GC-MS) and high-performance liquid chromatography (HPLC). By lowering the detection limit of the equipment, IFE has enabled the release of smaller tracer concentrations, thus reducing the amount of tracer required and the associated costs.

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 > 4437

Propagating ash for cash

Different mediums for the propagation of cuttings of European ash were studied in order to genetically improve and maintain genetic diversity.

The European ash, *Fraxinus excelsior*, is a fast growing and resilient tree which enjoys a wide natural distribution and produces valuable timber. Ash is tough and hard-wearing, does not split and has traditionally been employed to make spears and the handles of weapons and tools. In more recent times the wood has been used to produce furniture, flooring, snooker cues and tennis rackets.

The aim of the RAP project has been to genetically improve ash, while at the same time ensuring the conservation of genetic diversity in future generations of trees. Propagation of clones by cuttings was investigated as a means of producing high-quality plants on a large scale, benefiting nurseries, foresters, landowners, sawmills and furniture makers.

The main task for RAP scientists was to scale up the *in vitro* production of carefully selected ash material. This was provided by research institutes and used to produce clones for testing in the field. Five selected lines of ash were used to establish shoot producing cultures. High concentrations of

thidiazuron (TDZ), a plant growth regulator, gave better rooting on media without cytokinins, plant hormones that promote cell division. However, by employing an elongation medium that did not contain cytokines, the best rooting was achieved through the use of both cytokinin and auxin, also a plant hormone. Plants grown from two of the selected clones grew successfully when placed in soil and transferred to research institutes for field tests.

From an economic perspective, it was better to use cuttings from *ex vitro* plants, therefore cuttings were field tested in a commercial nursery. Cuttings were about 10 cm long and taken from the tip of the shoot or from the point where the leaf is attached to the stem. Cuttings from the tip were 80–90 %

successful in rooting, while those from the stem nodes were only 40–68 % successful. The work by the RAP project has demonstrated that it was possible to rejuvenate adult clones and furthermore, subsequent propagation through the use of cuttings.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4514



Managing stormwater runoff risk

Stormwater runoff is capable of polluting our supplies of drinking water and the environment in general. EU-funded research aims to help urban areas determine and manage the risk associated with this threat.

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 (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 experimental 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 EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4389



Living in harmony — reconciling commerce and conservation

The FRAP project has developed a pan-European framework that reconciles action plans between wildlife conservation and human resource use. This research has culminated in the publication of a book with the same focus, which is directed at managers and decision-makers.

In the United States, a fish and wildlife service that acts as a government authority resolves conflicts of interest and operates to this effect across the country. For the first time in Europe, a major attempt has been made to propose a generic framework that can be used to find solutions to previously ignored human-wildlife conflicts. These conflicts occur as a result of competition for scarce resources and a lack of cohesive strategy that can be applied to mitigate the divergence of interests.

The FRAP project was made up of an interdisciplinary team of researchers. They

approached their research by assessing the conflict of interest between fisheries in various case studies. In Denmark and Italy, the case of cormorants was studied, in central Europe and Portugal, otters and in Finland and Sweden, the situation of grey seals. Conflict arises between the different stakeholder groups. On the one hand the conservationists want the species to be protected by reducing competition for its food source and they highlight that many of these species will become extinct if this does not happen. On the other hand the fisheries are trying to bolster an already

weakening industry by competing to retain its production capability.

The book published, as a result of this research, outlines the key ecological features of typical conflict species and mitigation strategies including modelling approaches. It provides a concrete, step-by-step guideline for stakeholders to use, which is based on participatory strategies.

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

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

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New approach to urban stormwater management

In order to deal with a dynamic urban environment, stormwater managers need to change their approach. They should widen the focus of their strategies to include input from other stakeholders.

People have been managing stormwater in European towns and cities since the middle of the 19th century. More recently, an innovative strategy developed by the Daywater team has combined scientific and technical expertise with management skills and a knowledge of how societies function. The project offered solutions to four common challenges facing those responsible for managing stormwater in urban environments. These challenges included funding, involv-

ing the local populace, achieving political attention and cooperating with end-users and other stakeholders.

A process suited to the urban environment was developed within a water management framework. This enabled urban stormwater management (USWM) to be linked to economic activities. The challenge for those implementing the strategy was to work successfully with large numbers of stakehold-

ers and include their perceptions. It was also important to demonstrate the advantages of using USWM to the public.

Stormwater managers switched from a single-aim approach to a multi-aim approach. The focus was changed from methodology to ways in which urban stormwater management could assist in an area's sustainable development. This new interactive approach successfully linked USWM with spatial planning and the needs of the people inhabiting those areas where the project took place.

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 > 4312

New test to identify dangerous pollutants in stormwater

Identifying the potential environmental hazards that are posed to the environment from stormwater pollution is a complex task. Scientists have come up with a new research process that is capable of assessing the environmental risks to surface waters, soils and ground water by identifying the priority pollutants.

This research is part of a larger project which focuses on developing a system capable of adapting to the specific constraints it is given, in order to help decision-makers make the right choices in the challenge of managing urban stormwater pollution.

This study was conducted by a team from the Technical University of Denmark under the auspices of the EU-funded Daywater project. The scientists developed a methodology that can assess the environmental risks to surface

waters, soils and ground water. They set out the procedure for hazard identification and assessment. By identifying a list of priority pollutants, it is then possible, utilising this methodology, to evaluate different strategies which are effective for handling storm and waste water. Furthermore, the procedure allows for the identification of priority pollutants to be included in monitoring programmes.

Halogenated organic compounds (XOCs) are the most widely used man-made com-

pounds. They include many pesticides and solvents and chlorofluorocarbons, renowned for their capacity to deplete the ozone layer. The study highlighted that the XOCs that have been identified and quantified in stormwater up until now, are probably only a fraction of those compounds that are present. Sixteen XOCs were narrowed down by experts and all judged to have the inherent properties that make them potentially hazardous. Furthermore, some of them were observed in the environment in concentrations that could be critical for aquatic and soil-living organisms.

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 > 4348

New channel model for wireless communications

The concept of simultaneous use of differing wireless communication standards has led researchers to the development of dedicated models. Their results can be used in designing future communication systems on the basis of key quality criteria and in optimising transmissions within multi-user networks.

The FLOWS project was funded by FP5 to realise a future for wireless communication systems where standards would converge to ensure reliable multimedia services of a higher performance. Multiple-input multiple-output (MIMO) techniques were identified as a means of attaining the objectives set.

Deploying multiple antennas at the transmitter and at the receiver, independent data streams can be transmitted simultaneously from all the antennas. Moreover, significant improvements in performance can be achieved by exploiting the diversity of transmission channels and effectively transmitting the signal over multiple fading channels.

Nevertheless, to what extent MIMO techniques would be an efficient or even profitable alternative eludes researchers. A key

for the development of spatial diversity and multiplexing techniques that could answer the demand for increased spectrum efficiency of wireless systems is the characterisation of the channel properties.

A wideband double directional propagation channel model (WDDCM) was, for this purpose, developed by project partners at the Instituto Superior Técnico in Portugal. Multipath propagation involves signals reaching the receiving antenna through two or more paths in a highly-variable environment, and has as a consequence, the propagation channel to disperse. The channel response that ultimately affects the quality of services can, however, be estimated.

Arrays of antennas at the base station and mobile terminal can be included in the WDDCM model to allow for the propagation channel's characterisation and the exploitation of multipath diversity. Though not originally designed for MIMO systems, it has been extended to provide a robust platform for the implementation and simulation of MIMO as well as adaptive antenna techniques.

More specifically, to account for the antenna-to-antenna coupling, several modules have been added. The model was validated against measurements and already successfully applied for a prototype micro-strip patch antenna array, operating in the two frequency bands, UMTS and HiperLAN/2, covered by the FLOWS project.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4525



Crash test software

An EU-funded project, CHILD, has developed a database and associated software to better determine means to increase children's safety in vehicles.

Data, taken from several research projects on child and occupant safety in motor accidents, has been used to compile a reconstruction database. As a universal tool, it is used to store and manage data gleaned from crash and sled tests. The data parameters are detailed and involve such concepts as the general test conditions, static deformations, type and place of injuries sustained, vehicle characteristics, the environment of the dummy and its restraint system as well as test severity and angles of collision.

The software uses several media types to assist in its visualisation process. These include pictures, film and user-guided convivial screens. Other input is composed of component tests, index tables (for greater personalisation of test parameters) and consulting data. For ease of use and better cohesion between various users, it has been

made possible to enter information relating to test engineers, vehicle manufactures as well as specific data such as model of vehicle, number and type of tests conducted, or if new crash or component tests were added.

The data is furthermore configurable, allowing import and export of data modules and data exchange on selected cases to another CHILD database. This tool, having already been tested in more than 10 European testing centres met with the criteria of other project partners already

involved in testing and has been widely accepted by them. As such, it has proved to be an enormously useful tool for testing crash scenarios.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4480



The network of everything

Wireless experts believe that, by 2017, personal networks will have to cope with at least 1 000 devices, like laptops, telephones, mp3 players, games, sensors and other technology. To link these devices will require a 'network of everything'. It represents an astonishing challenge, but European researchers believe that they are moving towards the solution.

European researchers have just completed work on a networking project to perfect what will become known, perhaps, as the smart personal network. Personal networks (PNs), are seen as essential for a world where many different devices must work in sync together, known as fourth generation (4G). It will mean personalised services, low-power devices with cheap, ubiquitous and broadband connectivity.

The EU-funded 'Magnet beyond' project tackled all the issues surrounding PNs. Magnet stands for 'My personal adaptive global Net' and the project further developed the concept of personal area networks (PANs), first introduced in earlier PN projects Pacwoman and Magnet.

While the PANs link together all the devices and technology within a person's reach, the PNs spread the networking domain transparently towards the personal devices reachable via different network infrastructures. A PN belongs to and serves a private entity, a person, a fire fighter, or eventually a car, an aeroplane.

In the future, there will be hundreds, even as many as 1 000 devices in a PN. It may seem an impossible figure, but in the near future the number of personal devices will multiply enormously. One person might have dozens of sensors, monitoring vital signs like heart rate and temperature, and even the electrolytes present in perspiration. And then there are sensors and actuators in the home, including light switches, and more again in cars.

People will be able to link with TVs, stoves and spectacles, which could double as a personal TV screen, and even clothing. They will have a home gateway, to manage all their home devices, and a car gateway while driving.

A person may access remotely personal files from almost anywhere in the world as if he

or she were at the office. People will be able to include others in their PN and exchange personal information, or patch into a presentation in another conference room and watch it remotely. Many of these technologies already exist, but over time, they will become more widespread and connected.

In reality, it is hard to know what kind of devices or technology might be around for sure, but one thing is certain... there will be a lot of them. Hence the World Wireless Research Forum's (WWRF) prediction of 7 trillion devices for 7 billion people by 2017 — in other words, around 1 000 devices for every man, woman and child on the planet.

'In the industry, 2017 is like slang for a future where there will be many, many more devices that people use in their day-to-day life,' explains Professor Liljana Gavrilovska, technical manager of the 'Magnet beyond' project. 'This project prepares for that future.'

Right now, PNs usually involve fiddling around with Bluetooth settings and crossing your fingers. If it does work, users typically try to complete simple tasks by trial and error, like hunting for photos on your mobile or trying to transfer a tune from your computer to a PDA.

But in the Magnet model, users are able to easily set up their PNs with all their devices. 'We have a user-centric approach,' reveals Professor Gavrilovska, 'with the overall objective to design, develop, demonstrate and validate the concept of a flexible PN that supports resource-efficient, robust, ubiquitous personal services in a secure, heterogeneous networking environment for mobile users.'

In the 'Magnet beyond' vision, the devices will be self-organising and will be able to form geographically distributed secure networks of personal devices. This vision includes a platform for a multitude of personal applications and services to support private and professional activities in an unobtrusive, but dependable and trustworthy way.

Better yet, these networks will be able to federate with other PNs on a permanent or ad hoc basis. Users will be able to link their

PNs permanently with those of their friends and family, or temporarily with other people and companies depending on some purpose or joint interest. Users will be able to control precisely what devices and information other people can link with.

Four fundamental principles guided the consortium's work: ease of use, trustworthiness, ubiquity and low cost. 'For example, the system is designed to be user-friendly, with little or no training required and no need for system administrators,' Professor Gavrilovska explains. 'It will ensure security and protect privacy, and it will work everywhere, even without any additional infrastructure, but still be able to exploit any available resources, like wifi or cellphone networks, for example.'

The key elements to achieving these goals were personalisation and a tailored security, privacy and trust framework, including identity and the management of credentials. Credentials establish the trustworthiness of services outside the PN.

'We also designed it to be a future-proof architecture, to be self-organising, self-managing and aware of the context,' Professor Gavrilovska notes. The consortium even developed new hardware prototypes with optimised air interfaces, to ensure the 'Magnet beyond' platform worked efficiently.

It was an enormous challenge, but 'Magnet beyond' enjoys substantial resources too. The consortium includes 35 companies from 16 countries on two continents. It has a budget of over EUR 16 million, with EUR 10.3 million from the EU — and that is just phase two. Phase one, called simply Magnet, had 32 partners in 17 countries on three continents with a budget of EUR 17.4 million (EUR 10 million from the EU).

Both phases featured many of the world's leading corporations and research institutes, like Nokia, NEC, Alcatel-Lucent, Samsung, TeliaSonera, Telefonica, CEA LETI, VTT, CSEM, France telecom, Telefonica, Fraunhofer FOKUS, Delft University of Technology, NICT, Universities of Surrey, Rome, Kassel and Aalborg, GET-INT, and many others.

The effort was worth it, with a vast range of innovative technologies now delivering smart personal networks. PN that can be easily integrated into the future generations of wireless networks, and cooperate in the unfolding 'Future internet' and 'Internet of things'.

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Foundations for the World Wide Grid

The dream of using the internet to allow people to access as much computer processing and storage power as they need, when they need it, is a step closer thanks to European researchers.

Although a World Wide Grid running on top of the internet is still probably years away from being a reality, the grid, like the web before it, is starting to take shape between academic and scientific institutions.

Where the internet is a communications channel between computers, the grid goes beyond this by not just using the internet for communications but also as a means of sharing computing resources. Every computer and user can access and make use of the combined resources of the grid.

As things stand at the moment, there are a series of isolated grids which allow the resources of clusters of computers, at different universities for instance, to be shared. Each of these grids is usually based on its own proprietary middleware which makes interoperability impossible. Middleware is a type of software which connects hardware resources to a grid. There are different middlewares available, each tailored for different scientific, commercial or industrial usage. Another barrier to the development of the grid system is its difficulty of use requiring, as it does now, knowledge of specialised computer languages and coding skills.

It is against this background that the EU-funded g-Eclipse project has been developing an easy-to-use, Windows-like graphical interface which allows access to grid resources with a few mouse clicks.

'Entering and using a grid has been too difficult for most people, so we are developing a system which allows the ordinary student to use grid resources. Until now, these have only been available to academics and scientists able to enter complicated command lines. Instead of something that takes months to learn, we are developing a graphical user interface (GUI) which can be operated by anybody with a basic knowledge of computing,' says project coordinator Mathias Stümpert.



The idea is to develop a system which is middleware independent, so a user can access any grid in exactly the same way using the same actions and commands on the GUI. The 'g-Eclipse' system also aims to allow users to work with different grids at the same time and switch data between them.

'You can think of g-Eclipse as a browser for what will become the World Wide Grid,' says Stümpert. 'It searches for and displays the resources that are available, and allows the user to access them. Complicated computing jobs which need more processing or storage than are available on the user's system can be sent to the grid. Data can be transferred from the local computer to the grid and workflows can be managed.'

The project is making use of the Eclipse open-source ecosystem, which has thousands of developers and a very large user base and is host to numerous application development projects from around the world.

'We chose Eclipse as our medium because it allows us to create a user base and it also means anybody in the world can contribute. Eclipse projects are really transparent and open, more so even than Linux, and source code can simply be reused between Eclipse programmes.'

'With support from the Eclipse Foundation, we get a lot of functionality from the ecosystem and the use of a lot of infrastructure, such as software or code repositories. The project develops a life of its own which allows it to continue even after the EU funding has been spent,' Stümpert says.

So far, the middleware-independent 'g-Eclipse' core architecture has been configured to work with two brands of middleware. Initially, it was assessed using the scientific gLite middleware which is used by European scientific institutions, but plugins have also been developed for the GRIA middleware which is in commercial and industrial use.

The system has also been configured for use with computing clouds, and specifically Amazon.com's Elastic Compute Cloud. Cloud computing allows firms which have installed computer capacity to cope with peak periods, such as Christmas, to hire the excess capacity out.



Site administrators expecting unusually heavy traffic can lease tens, hundreds or even thousands of virtual servers from firms like Amazon, for minutes, hours or days at a time as and when the extra capacity is required.

While other GUIs have been developed for this purpose, g-Eclipse is currently the only one allowing data to be transferred between the real world of grids and the virtual world of clouds.

'We are not just supporting the individual user, although we do already have a lot of new users sending their daily jobs to the grid, but also a framework that can be used for other developers to build their applications on,' says Stümpert.

His hope is that the Eclipse community, having seen the value of the work to date, will continue to push back the boundaries with other developers plugging g-Eclipse into all the grids and clouds which connect to the internet.

'While at this early stage our users are mainly students, a few years down the road g-Eclipse could be a part of everybody's desktop. Perhaps there will be a layer in computer operating systems which allows applications to be executed on the grid rather than the local desktop.'

If and when that happens, every PC user could well have access to all of the computing power and speed they could possibly require.

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Monitoring interactive applications on the grid

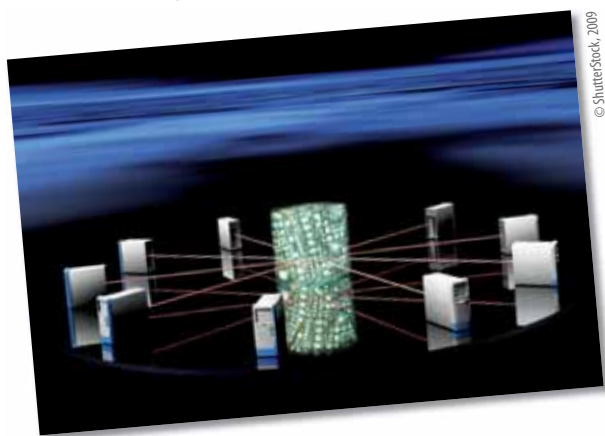
With the advance of computing techniques, one question that arises is how the quality of the grid infrastructure and the performance of applications running on the grid can be measured. This information is essential for end-users, in addition to administrators.

For industrial applications and for research, current needs of computational power can only be satisfied by using parallel and distributed architectures like multiprocessors and multicomputer systems. Among the central research topics of the Crossgrid project, funded under FP5, was to investigate online monitoring methodologies for such parallel systems.

Project partners at the Technische Universität München worked on establishing a software layer that would connect the system running an application programme with tools observ-

ing and modifying its operation. Performance analysers and debuggers are examples of these tools that collect information about the application's execution and they are needed to set breakpoints. The OCM-G system was designed to provide the monitoring infrastructure required in developing interactive applications on the grid.

The cluster of networked computers that act in concert to perform data-intensive applications such as simulations of surgical procedures and comprise the grid, poses new requirements to the monitoring infrastructure. Designed as an autonomous structure, the services of the OCM-G are made available through the standardised interface 'On-line monitoring interface specification' (OMIS). The latter suited the requirements for an interface that would provide a flexible set of monitoring services and made it possible to control them.



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Good grid monitoring

Grid networks are becoming a more potent means in which the world communicates and shares vast volumes of information at a very rapid rate. The Crossgrid project investigated new ways in which to employ new grid components for safer, faster data transfer.

Medical procedures, rescue personnel, risk management teams, scientists and even environmentalists are just some of the people who use grid technology to share information. With the growing requirements of grid technologies, and the need for various sharing between (or across) different grids, comes the need for greater security, more compatibility and greater ease of use. Large data volumes are generated from these sources and as such, the project developed the SANTA-G NetTracer as a support tool.

The SANTA-G NetTracer provides this support by allowing users to access log files. This bypasses the need to access files that may not be in a compatible format. The libcap file is standard to the EU datagrid's relational grid monitoring architecture (R-GMA) and information system. Both Tcpdump and Snort are tools that generate log files in this format, the latter will be used

to assist in the development of a security feature detecting network intrusions.

The technology is focused on network administrators to assist them in monitoring traffic across the network and across the grid. It provides analysis tools that render data related to performance issues assisting in performance analysis. It also provides the means for ad hoc monitoring of the grid through the use of the generic grid-enabled framework.

The project's diversity can be seen in its

The monitoring services return low-level information; however, OCM-G enables different pieces of information to be combined into high-level metrics with the semantics that end-users need. Due to the online approach adopted to monitor running processes, active instrumentation employed for gathering the essential information was kept to a minimum. To further reduce the monitoring intrusiveness, the rate of information retrieved was reduced to ensure high responsiveness. To use the OCM-G system, their message passing interface (MPI) libraries need to be used so that each time a process is executed, relevant monitoring data are collected.

The first prototype of the OCM-G is continuously being improved to provide new services and the base for other types of tools supporting application development, specific for the grid. The future plans include the implementation of new features to monitor the performance of dynamically changing Java applications and threaded applications on shared-memory machines.

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

Collaboration sought: further research or development support.

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cross-grid application development aspect, and its various dimensions. It will investigate grid application development, grid services and tools and grid programming environments to name but a few. Further research and development (R & D) is planned.

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

Collaboration sought: further research or development support.

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Satellite4All: new technology promises cheap satellite triple-play

Technology developed by European researchers promises to dramatically lower the costs of satellite bandwidth, potentially bridging the digital divide and enabling satellites to deliver TV, internet and telephony services via satellite. The technical problems are solved, now the research team is working hard on the business case.

Service providers could start offering satellite TV, broadband and voice services for less than EUR 50 thanks to satellite technology innovations by European researchers. Eurostat estimates that 10 % of the European population, or 30 million people, are too isolated to be covered by landline broadband services and, so far, no viable solution has presented itself.

Experts hoped that wimax — a long-range version of the wifi wireless technology — would fill the gap, but large wimax networks are expensive to deploy, and the technology is just beginning to mature.

Satellite services could fill the gap, but in this case, the bandwidth costs are very high. A basic internet service via satellite can cost EUR 150 to 200, way out of reach for the vast majority of users. But those costs could drop dramatically thanks to the work of researchers from the EU-funded Imosan project working on integrated multi-layer optimisation in broadband 'Digital video broadcasting – second generation satellite' (DVB-S2) networks. Imosan took advantage of new standards to squeeze more bandwidth from satellite transmissions.

The team also developed components that could offer 'triple-play' services — TV, internet and telephony. Finally, they developed optimisation software that could help ensure the best possible service quality in bad weather or during high-demand periods.

The Imosan project solved many of the technical hurdles facing widespread satellite adoption for triple-play services. But an equally important element of their task was to prove the business case to make these services viable.

'We had to study the market and examine all possible business models to try and establish a competitive offering for satellite triple-play services,' explains Natassa Anastasiadou, a researcher at Imosan responsible for market studies and director of the department of funded programmes at OTEplus.

'The technical advances made by the Imosan project mean that satellite bandwidth is 30 % more efficient, but we had to see how that translated into real-world costs for real-world business scenarios,' she relates.

Anastasiadou and colleagues whittled the possible offerings to three scenarios for rural and remote regions. They first covered residential users in isolated areas, served by a purely two-way satellite solution, enjoying high-end services, including high-definition TV channels. Imosan calls this the 'gold scenario'. The 'business scenario', meanwhile, looked towards isolated areas served by a hybrid satellite-wifi solution, where the emphasis is put on fast internet access. Finally, for the 'basic scenario' the team looked at delivery to scattered residential users, served by a hybrid satellite-wimax solution, where a standard triple-play package is provided — similar to common packages provided in urban areas by ADSL technology.

'Obviously, the lowest price the Imosan provider could charge the end-user for the triple-play service package provided depends strongly on the maximum number of users it can serve with a given investment,' notes Anastasiadou.

The gold service package was designed to fulfil the requirements of residential users in isolated areas and included fast internet access of 1 Mbps download, voice over internet protocol (VoIP) services and 13 TV channels (10 standard and 3 high-definition). The analysis showed that this package should be priced monthly at EUR 147.60 (at least) for the investment to be depreciated over 10 years. At that rate, the terminal had to be provided to end-users for free, whereas if the end-user paid for it, the monthly rate came down to EUR 87.50. But an Imosan terminal would cost EUR 1 500 against EUR 350 for standard satellite terminals.

The business scenario fared better. The service package envisaged fast internet access of 2 Mbps download, VoIP services and five standard-definition TV channels. It required a monthly rate to be charged to the user/business of EUR 181.30, again over ten years. It included the terminal, and would be competitive with existing services, especially given the very high quality and service standards, as well as the triple-play offer.

The basic package was tied into wimax technology. Wimax is a long-range, high-speed wireless networking standard that is just beginning to experience large-scale deployment in the EU and the United States. The satellite transmits directly to the wimax

transmitter, which then delivers service to individual customers.

'It is much more cost-effective to offer the service this way,' reveals Anastasiadou. 'Every single end-user does not have to get a satellite receiver, which costs over EUR 1 000, but shares the cost of a wimax station instead which, although currently costing about EUR 10 000, can serve about 300 end-users effectively.' And as they continue deployment, wimax receiver prices will probably drop dramatically, making the basic scenario even more cost competitive over time.

The Imosan basic scenario consisted of seven standard TV channels, 1 Mbps internet and VoIP targeted at the largest group still without ADSL access: scattered residential users in rural areas. It was the most successful scenario studied by Imosan, costing EUR 57.20 with a contention ratio of 30:1. The contention ratio indicates how many users can access a single channel at one time.

At a ratio of 50:1, which is reasonable for residential services, monthly costs would drop to EUR 37 a month, which is very competitive with alternatives like standard satellite to individuals.

The work has generated considerable excitement among service providers and satellite operators, with one company currently considering a basic service deployment in Greece, and many others interested.

Through its technical advances, Imosan will have an impact on satellite services generally, but its greatest impact could be ensuring that all Europe's citizens have economic access to the internet — one of the most essential services of the information age.

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Collective solution to accessing the internet via satellite

In many rural areas of Europe, getting on the internet means putting up with sluggish dial-up connections or, at best, erratic mobile services. A new satellite-based solution developed by European researchers promises to change that.

Plugging the gaps in broadband internet access via two-way satellite is not a new idea, but to date there have been relatively few examples of successful commercial deployments in areas where cable and DSL services have yet to reach. The fact that the signal has to travel 36 000 km into space and back typically causes high latency, making applications such as voice over internet protocol (VoIP) erratic, while the cost of the connection is often prohibitive for farmers and other rural residents who may just want to send email and check the weather forecast.

Part of the problem is that many previous initiatives focused on providing each home, ranch or farm with an individual satellite connection via their own two-way dish and developing new protocols to ensure quality of service, further pushing up implementation costs.

The researchers behind the EU-funded UNIC project took a different approach. Instead of individual dishes, they use a single dish to create a collective satellite gateway for a whole village or rural area. Local homes and businesses can then connect to the gateway via cables or wireless technologies, such as wimax, while more remote homes can access the internet with their own dishes.

Instead of reinventing the wheel when it came to ensuring quality of service, they adapted existing protocols and standards for new uses. And they focused on offering more services than internet access alone, including interactive digital television and video conferencing.

'We estimate that the monthly cost for users would be somewhere between 50 and 100 % more than they would pay if they lived in

a town or city that had DSL coverage. That may sound like a lot, but it is still reasonable if there are no alternatives,' explains Marco Luise, who is in charge of the UNIC project's dissemination activities at the University of Pisa, Italy.

He foresees the UNIC system being cost effective in villages with populations of up to 1 000 people, at which point more traditional broadband access technologies, such as cable and DSL, become competitive, despite the cost of laying lines and setting up telephone exchanges.

The satellite connection offers data transfer rates of between 1 and 2 Mbps compared to the 8 Mbps now common with DSL, but Luise notes that such transfer speeds are acceptable for most users. 'We carried out field trials at Montignoso, a village in Tuscany, Italy, where previously they had only telephone lines and the reaction of the test users was very positive,' notes project manager Jean-Michel Merour at Thales Alenia Space in Toulouse, France. Other trials took place in Paris, Marseille, Cambridge and Hamburg with similarly positive results.

The UNIC system improves data rates and services by prioritising access depending on what each user is doing, thereby overcoming many of the quality of service issues that have dogged previous attempts at satellite broadband.

Using a technology called adaptive coding and modulation (ACM), originally developed as part of the 'Digital video broadcasting – second generation satellite' (DVB-S2) standard to improve satellite reception in bad weather, the team have been able to make the UNIC system automatically adapt to users' bandwidth requirements. 'Someone making a video conference or VoIP call, for example, will take priority over someone surfing the internet,' Luise explains.

Digital television is provided on top of the bandwidth used for internet access, while the system also offers ample scope for other services to be added. These could include environmental and crop monitoring — applications of particular interest to farmers — or educational



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services and tourism information. In addition, because connections are made via a set-top box and TV, it allows people without computers or with little computer experience to access services just by pressing buttons on a remote control, thereby avoiding a steep learning curve.

'UNIC bridges the digital divide not just by giving rural residents broadband access but also by making it easier for people without computers to get online,' Luise says. Besides Europe's rural areas, the system's ease of access and scalability makes it a strong candidate for providing telecommunication services in developing countries. 'Many areas of Africa, for example, have no telecommunications links. The focus now is on providing them with mobile phone coverage. However, satellite offers a viable alternative,' Luise notes.

Though the UNIC project has demonstrated the ability of satellite broadband to bridge the digital divide between rural and urban areas and developed and developing regions, there are still obstacles that need to be overcome before the technology can be deployed commercially. The principal factor is the initial implementation cost, something that Luise argues would have to be covered by a public-sector institutional partner, such as a town council or regional government to ensure the costs for end-users are acceptable.

'Public funding would be needed to give it sufficient initial momentum,' Luise says, noting that the project consortium is currently looking for just such a partner. The UNIC project received funding under FP6.

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Sensor tech develops whiskers

Modelling technology on the behaviour and abilities of animals and insects has come a long way in advancing the world of sensor technology. An EU-funded project makes use of whiskers to provide a tactile means to explore and develop object recognition technology.

Within the world of robots there already exists a host of devices that amaze and inspire us as to their capabilities. From automatic vacuum cleaners to robotic toys, precise medical instrumentation to explorative devices, robotics has made great headway. Indeed, developments have come so far as to now be venturing into the realm of biorobotics and neural research.

The Amouse project headed by the Max-Planck-Institute for Psychological Research has developed a robot based on neural input

that combines principles of synthetic biorobotics with neurophysiological behaviour. Having developed a model that is based on the whisker system of rodents such as mice or rats, the robot is unique in that it illustrates both the adaptive and the sensory behaviour of rodents.

The whisker model is capable of measuring phasic responses along two orthogonal directions. This is due to its two-pair whisker construction, and therefore makes the device suitable for shape recognition tasks such as mapping the physical features

of terrain. The developed product hosts other advantages in that it is a low-cost and robust technological solution, especially considering that its construction allows it to measure slanted surfaces.

Aside from the technological achievements of the developed whisker sensor, the project also has an additional purpose behind the development. Since it is modelled on adaptations developed in animals, the development will contribute towards research where the artificial serves as a platform for real world neurobiological advancement.

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

Collaboration sought: information exchange/training.

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Beating the standard quantum limit

In their quest for novel information processing techniques, the development of elementary scalable quantum processors and controlling quantum information storage was among the greatest challenges faced by Squbit-2 project partners.

As the integrated circuit components of conventional computers are rapidly approaching the so-called 'quantum limit', scientists have not been working on avoiding quantum effects. Instead, the opportunity to exploit them as a means of more effective computation was the main focus of research conducted by the Squbit-2 project partners.

The intrinsic properties of quantum systems could enable quantum computers to perform parallel computations, to decrease processing time, and moreover to solve problems considered intractable for conventional computers. The unique potential of superconducting tunnel junctions to build

sufficiently large, but still controllable systems of quantum bits (qubits) was explored at the laboratories of the Technische Universiteit Delft.

In conventional computers, information is often stored as electrical charge on tiny capacitors. The presence or absence of charge on a single capacitor represents a bit, corresponding to the two different charge states. Remarkably, multiple qubits can be placed in a mixture of all possible states, a phenomenon known as entanglement. Complex manipulation of entangled states was for the first time reported by the Squbit-2 project partners.

More specifically, a superconducting flux qubit, containing three in-line Josephson junctions was coupled to a superconducting quantum interference device (SQUID). The latter provided the measurement system for detecting quantum states, in addition to acting as a harmonic oscillator. By means of microwave spectroscopy, the entangled state generated could be controlled and the resultant Rabi oscillations of the coupled system detected.

These research results provide strong evidence that solid state quantum devices could in the future be used as elements for the manipulation of quantum information.

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

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

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Seismic imagery on the web

An image based database for seismic activity has been constructed by the Seiscanex project.

Developed through EU-funded research, the database currently contains 13 000 adaptive optics images of seismic recordings. Compiled by the Seiscanex project, the work involves images and recordings taken as far back as the 1960s. The project, overseen by the National Oceanography Centre in Southampton, is part of a conglomeration of research institutes dedicated to the pursuit of oceanic research excellence.

Managed by the Caldera Graphics 'Collection' database system, it contains thumbnail and mid-resolution images that can now be viewed with the average web-based browser. Moreover, the images denote such interests

as rock formation, type and tectonics in high-definition colour. The images have been created through the use of electromagnetic soundings, ocean bottom seismology and sea floor imagery and scanned digitally to be compatible with (and used by) electronic media.

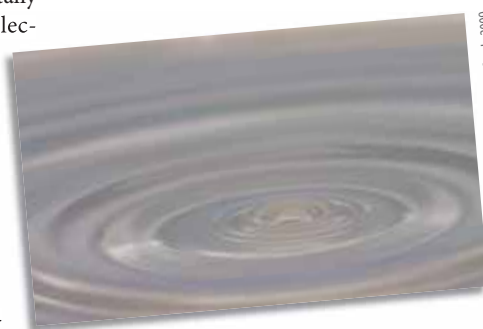
As part of the National Environment Research Council and working together with such institutions as the Université Louis Pasteur in Strasbourg and other agencies in Greece, Spain and Italy, the project has resulted in maximum dissemination of subterranean oceanic information. The distribu-

tion will aid in the dissemination of knowledge and resources to complement further research groups and activities.

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

Collaboration sought: information exchange/training.

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Free software gets an education

Companies, organisations and citizens spend billions of euros a year on licensing fees for proprietary software. Could that money not be put to better use developing free software alternatives and local expertise?

For that to happen, teachers, software developers, researchers, IT managers and citizens in general need to be educated about what free (also known as libre or open source) software is, how to use it and how to get the most benefit from it. But until now educational content and training resources about software that is free to use, copy, change, study and distribute have been woefully hard to find.

SELF, an EU-funded project, has started to change that. Inspired by the community-driven development model that has led to such enormously successful initiatives as the contributor-edited online encyclopaedia Wikipedia, the researchers behind the SELF project have created an online platform to develop and collaboratively distribute educational materials about free software.

Just as Wikipedia has become one of the leading sources of information on the internet, the SELF team hopes their platform will turn into a leading resource for anyone looking to gain a better understanding of free software. The platform allows contributors to add and update a wide variety of educational materials, from simple articles to structured courses, and to collaborate on developing new training resources on diverse applications and subjects, from the Linux operating system to complex scientific programmes.

SELF project coordinator Wouter Tebbens says the team was driven to launch the project when they realised that a lack of educational resources was holding back the adoption of free software in Europe and elsewhere, despite its many advantages over proprietary alternatives.

The 'free' in free software refers to freedom of use, modification and distribution, resulting in programmes that tend to be more adaptable, scalable, transparent and (frequently) more cost-effective than their proprietary counterparts.

'We identified four factors holding back the adoption of free software: Firstly, there is a lack of awareness about what free software is. Secondly, there is a perceived lack of technical support for free software products. Thirdly, teachers and trainers are mostly unprepared to teach it. And, fourthly, they didn't have the necessary resources,' Tebbens, the president of the Amsterdam-based Free Knowledge Institute, explains.

By addressing the latter issue, in particular, the SELF team are confident that the other obstacles will also be overcome. With educational materials at their fingertips through the SELF platform, university and school teachers, vocational trainers, IT managers and software developers will have fewer excuses not to learn about free software and provide students and staff with training in it. That, in turn, should raise general awareness about free software's benefits and uses, and, ultimately, increase the adoption of free applications and tools in both the public and private sectors. 'Our target audience is anyone with a role in teaching or training, as well as anyone in the software development community,' Tebbens says.

The SELF platform, which is obviously built using free software, is the first platform in the world that allows users to generate, update and distribute educational materials collabora-

tively, the project coordinator says. In essence, it merges the community-driven approach of Wikiversity — an educational information repository set up by the Wikimedia Foundation, creator of Wikipedia — with the e-learning capabilities of free software learning management systems such as Moodle. 'We have incorporated the best of both worlds, while adding some innovations of our own,' Tebbens says.

Among the innovations are a way to judge the quality of the content on the SELF platform through a popularity ranking system, middleware to allow materials in different formats to be shared, and a P2P file-sharing architecture that lets contributors host resources on their own servers.

The platform evidently does not need to be used solely for educational materials dealing with technology, but could be used to create and share any kind of educational content. 'We have seen interest from organisations outside the consortium who want to put it to other uses, and because it's free software they are free to do so,' the SELF coordinator notes.

The consortium's own work in the free software field is due to be continued by a new organisation that Tebbens says will be similar to the Wikimedia Foundation and will rely on donations and funding from partners to operate and maintain the SELF platform.

'Many of the SELF project partners want to continue with this for several reasons. The Open University of Catalonia (UOC), for example, wants to use it to maintain its course materials in collaboration with other partners, while an Indian partner, the Tata Institute of Fundamental Research, is using it as a testbed for its semantic knowledge engine,' Tebbens explains.

To raise awareness about their work, the project partners launched the 'Free knowledge, free technology' conference, the first edition of which took place in Barcelona in July 2008, attracting representatives of the software development and educational communities from around the world. They have also published a book titled 'Introduction to Free Software' that has been incorporated into a UOC master's course.

'The response to the project has been very good... I think we are opening a lot of people's eyes to the importance of combining teaching and technology,' Tebbens says. In that awakening, he hopes people will take the project's motto to heart: 'Be SELFish, share your knowledge!'

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Making the classroom a playground for learning

Playing computer games in school may sound like the kids rule the classroom. But European researchers have shown that such games can be used to boost learning.

What's more, the special computer games developed by the EU-funded eMapps.com project could help build communities of creative, networking children across Europe, especially in the most recent EU Member States.

In the past, the playing of computer games was sometimes thought to be unhelpful, disruptive, and potentially dangerous for a child's development. Attempts to use them for education were not always successful.

But research has shown that people learn best when they are entertained, when lesson plans stimulate both thinking and emotion, when they can creatively work towards complex goals, and when the consequences of actions can be observed.

By using mobile devices such as personal digital assistants (PDAs) and portable phones, researchers in the eMapps.com project developed interactive tools, primarily games, to achieve learning objectives and deliver the curriculum using information and communication technologies (ICT).

'eMapps games are not like well-known everyday computer games,' says Gabriella Lovasz, the project manager of eMapps.com. Lovasz works at Cross Czech, a consultancy firm in Prague. 'The games require high levels of teamwork and collaboration, are challenging intellectually as well as technologically, and break new ground in mobile learning.'

However, to provide children with educational game play, the eMapps.com researchers had to overcome the age-old challenge for interactive games — creating an engaging narrative, or linear storyline.

'eMapps games are dynamic and narrative, creating virtual worlds or mixed realities, outdoor and indoor,' says Lovasz. 'The actions of different players lead to completely different and credible outcomes.'

And subjects such as history and geography can be brought to life using these techniques. One such example is the City Game. The researchers based it on the narratives about any city written by citizens and used what is called the alternate reality game (ARG) concept. ARG describes an interactive narrative with the real world as the stage, with a storyline that may be affected by the actions of a group of participants.

In the eMapps.com game the children act as citizens and discover more about the city they live in by solving different puzzles con-

nected to the history of the city. The children also have to find the ultimate solution of the story themselves.

'The experience of playing eMapps.com games demonstrated quite clearly that it is possible to design meaningful learning experiences which make full use of the benefits of mobility — in other words that "anytime, anywhere" learning was a reality in the game-playing situations which were analysed and observed during the project,' says Lovasz. To achieve the full potential of the games for education, the learning must go beyond the physical boundaries of the classroom. For this reason, the project focused on using digital devices such as mobile phones, PDAs and tablet PCs over GPRS and UMTS networks.

Children across Europe can participate in the multilingual, multicultural content created through the games. Forums and online chat, as well as weblogs, podcasts and video-casts are used to add to the interactive learning experience and build a sense of community among the participants.

The platform, available through the eMapps website, allows school children to use skills valuable for successful game play. 'In the future, learning will move increasingly from the classroom and into the learner's environments, both real and virtual,' says Lovasz.

Teachers, who played a key role in the development of the eMapps.com game, can also reap the benefits of the project's work. The project's researchers initiated preliminary training and information sessions to find out how best to combine games and mobile technologies to provide new and enriching experiences for children in the school curriculum and beyond.

'During these sessions the teachers, parents and IT experts could discuss what are the advantages and disadvantages of learning through games, how would it be possible to develop a game taking into consideration the local characteristics and what are the chances of including the games in the curricula,' says Lovasz.

And now it is the teachers who decide on the content of the games. The network access allows them to draw on content from other repositories while creating games. The project involved 17 participating schools across eight new EU Member States: Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia, and Slovakia.

The activities have the potential to contribute to the growth of a community of teachers who can exchange knowledge and experience by communicating with counterparts in other countries — creating schools without walls.

'In countries where new policies are shaped in the near future there are several possibilities of influencing the contextual factors that allow the effective integration of mobile technologies and game-based learning in education,' says Lovasz.

'Moreover, in most of the new Member States in focus here, education reforms have been initiated or are entering into force, which offers a lot of possibilities, but can also cause uncertainty and resistance by those affected,' she adds. 'The recommendations that are formulated by eMapps aim to influence these future decisions taken in the development of national, regional or local policies for ICT.'

Giving children mobile devices to play games in class may not sound like every teacher's idea of a good idea, and for that reason a key goal of the project is to help them understand their value, along with parents and policy-makers, says Lovasz. Projects like eMapps.com, which received funding from FP6, are already contributing to the increasing use of games to enhance learning in both formal and informal settings, she adds.

'A major effort is still required to convince policy-makers that the learning and skills acquired from games and the use of mobile tools are relevant and appropriate for children in the knowledge society. eMapps.com has also provided plenty of evidence that game-based learning can be matched to curriculum requirements. Breaking down suspicious attitudes towards the value of games among school directors and teachers is a further prerequisite if they are to become part of a mainstream approach to blended learning in schools,' says Lovasz.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=89854>



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Nanomaterials in dental applications

The comparative advantages and the ease of use of titanium (Ti) as a machine material turn into difficulties with its usage as a casting material in prosthodontics. The aim of the Catipro project was to produce optimised Ti-based nanomaterials for a wide variety of dental applications.

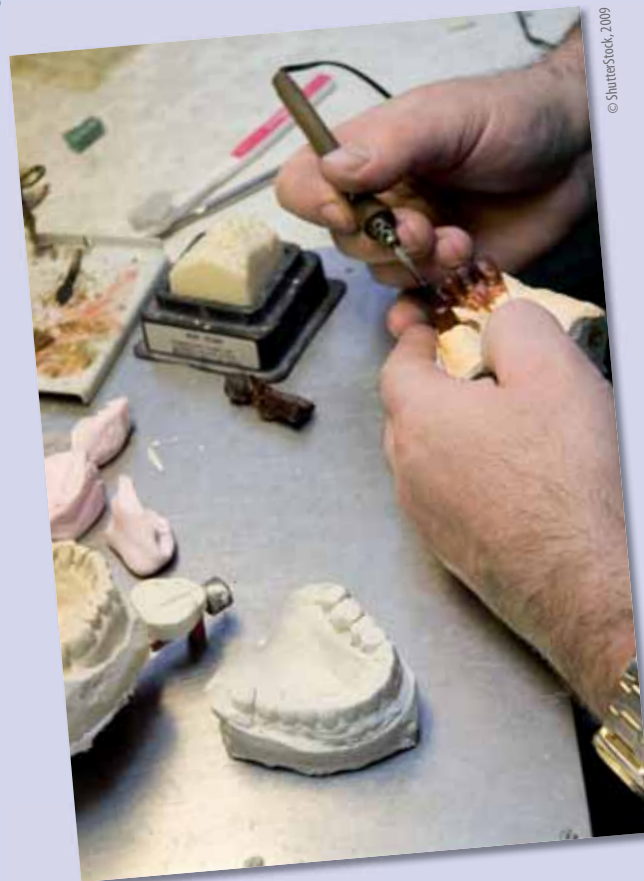
Commercial pure titanium (Ti) exhibits remarkable advantages, when compared to conventional dental alloys. In addition to biocompatibility and remarkable corrosion resistance, the abundance of this cost-effective material offers attractive alternatives for conventional dental alloys.

The Catipro project, funded under FP5, focused on the difficulties of casting Ti, which relate mainly to its high melting point and enhanced reactivity at high temperatures. Although dental laboratories use investment materials, Ti has high chemical affinity with silicon (Si) and forms a series of Si-Ti compounds.

Project partner Cereco S.A. focused on the extensive contamination observed in Ti castings when SiO₂-based investment materials are used. Ultimately leading to microstructure modifications, this contamination at the surface of dental Ti castings influences the corrosion and mechanical properties of the final cast work. From a clinical point of view, it increases the casting's surface roughness while reducing its fatigue limit within the highly corrosive oral environment.

Elements from investment materials such as silicon (Si) and phosphorous (P) can be found in a depth of a few tenths of microns by means of scanning electron microscopy. In an attempt to minimise incoming Si and P elements, researchers replaced the conventional phosphate-bonded investment materials with new ones based on magnesia.

Moreover, yttria-stabilised zirconia coatings were prepared using nanostructured and conventional powders and were applied to the surface of wax patterns to reduce the thickness of the reac-



tion layer. The efficacy of the protective coating offers exciting new possibilities to exploit the perfect biological and mechanical properties of Ti in the field of dentistry.

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

Collaboration sought: licence agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4528

Sled test procedure tests child restraint systems

Frontal impact crash tests were undertaken to gather information on the effect on child occupants of vehicles. The information was used to improve the safety of children through better child restraint design, evaluation testing and regulation.

Each year around 700 children are killed on Europe's roads and a further 8 000 are injured. As the population becomes more mobile, children are increasingly transported by car making the likelihood of them being involved in an accident even greater. The CHILD project addressed this problem by developing an optimum level of protection for children in cars. This was achieved through better design, methodologies and tools that reduced the risk of injury to children.

Although research had been carried out on adult occupants of cars, little was known about the effect of a frontal impact on children. The project not only proposed improved standards and testing proced-

ures, but also new methods for virtual child restraint system (CRS) development and testing. This was a major step towards the development and evaluation of CRSs that would offer children the best possible protection in cars.

Researchers sought to achieve a better understanding of events in real car crashes and the resulting injuries experienced by child occupants. The CHILD project carried out a number of reconstructions of these crashes. The resulting data was used to calculate the child kinetics for a range of impacts for children of different ages using a variety of CRSs. Real world observations, reconstructions and computer simulations were used to evaluate the effectiveness of the CRS.

One of the first goals of the CHILD project was to develop a sled test procedure that would determine the effectiveness of CRSs in frontal impacts. The work was undertaken in a way that ensured test conditions were reasonably similar to those employed by the earlier CREST project for adult occupants. The CHILD frontal test procedure was based on those used for Q-series dummies. The project recommended that the CREST frontal impact test procedure was suitable for investigating the injury criteria that were developed in another CHILD work package.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4521

Smart dummies may help save children's lives

Improvements in human dummies achieved by transport safety specialists in France could help better protect the lives of children travelling by car.

Children are especially susceptible to injury in automobile accidents. In order to incorporate additional safety features into vehicles, it is necessary to collect experimental data using human replicas. In the context of the CHILD project, the Institut National de Recherche sur les Transports et leur Sécurité (Inrets) redesigned a family of human dummies for this purpose.

The Q family of biofidelic dummies was targeted. A more realistic model of the human thoracic region was implemented by sepa-

rating previously connected parts of the abdomen. In addition, the abdominal pressure sensors were split into right and left components to provide better feedback during both head-on and lateral collisions.

Data from the sensors was used to derive protection reference values (PRV) for all body segments. Inrets employed a methodology defining an abdominal injury criterion (AIC), which is dependent on the rate of pressure change (V) and the pressure magnitude (P).

Prototype and sled tests were performed during CHILD to examine issues related to durability, repeatability, deceleration and response to belt penetration. Both Q3 and Q6 dummies were evaluated. In a second phase, Inrets simulated accidents in an effort to gauge the suitability of the AIC approach. The initial results were positive and have encouraged the CHILD consortium to continue pursuing this line of research.

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

Collaboration sought: joint venture agreement; licence agreement; venture capital/spin-off funding.

<http://cordis.europa.eu/marketplace> > search > offers > 4503

Reframing health and safety standards

The Trends project worked on developing a broader approach to the way health and safety standards are applied to the energy industry. The consortium, made up of stakeholders with differing motivations, searched for a more holistic approach to health and safety, one which would incorporate corporate social responsibility into its definition.

The Trends project built up a network of researchers who focused on facilitating the improvement of health and safety standards as they apply to the energy industry, primarily in order to push it to become more sustainable. Its members developed reports which highlighted the deficiencies in key fields of the operational practice previously being used.

Using trans-national experience the scientists worked on adopting a holistic approach. In order to do this they took a broad approach

to defining health and safety standards used in the energy industry. In particular, they looked at human factors such as workforce competence as well as research and technology development and technological innovation. It was also decided by members that a truly holistic approach to health and safety should include corporate social responsibility. This represented quite a definitive move from what previously existed.

The analysis formed a basis for a recommendation concerned with new strategies. The

report prioritised the inclusion of R & D initiatives. One of the overall aims of the Trends project was to provide a platform for a European consortium to take the lead internationally in new areas of development related to health and safety in the energy industry.

In part the consortium achieved this aim. The work done by the partners helped to define principles contributing to a more sustainable and secure European energy supply in terms of high quality and safety standards.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4484

Safety testing of heating in electrical appliances

The Low-voltage Directive (LVD) deals with safety issues arising from electrical equipment. Implementation of the directive into newly associated countries has helped eliminate barriers to international trade.

The proper safety testing of household appliances and other electrical items is an important and necessary step in protecting potential users. This can be assured through EU directives which refer to particular standards. The aim of the LVD project has been to support measurement and testing (M & T) laboratories in newly associated countries, enabling them to fully implement the directive.

One important international standard considered was ISO/IEC 17025, which includes criteria for M & T laboratories which produce testing and calibration results. The standard is similar to the ISO 9000 quality management system, but explicitly requires evaluation of measurement uncertainty and traceability.

One of the tests that must be complied with was the heating of appliances. The appliance should not affect its surroundings more than specified. If it does overheat the possibility exists for damage to occur or even a fire to break out. Therefore, a proper understanding is needed regarding the heating of the appliance; this is achieved using a system of measurement known as the black test corner.

Each measurement system contains an element of uncertainty. It was important to correctly evaluate the level of uncertainty. The LVD team studied how to guarantee correct traceability measurements of heating in the black test corner when a case study test was performed. The team developed a

systematic approach to testing in the black test corner. Traditionally laboratories have employed different methods of testing, but these are only applicable to particular tested appliances.

The black test corner could be considered as a complete measurement system. It can be recalibrated on a regular basis, providing traceable and reproducible measurements. A major benefit of the black test corner was that low voltage appliances, which are not required to be electronically tested, are nonetheless capable of starting a fire.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4533

SMEs make Europe's innovation clock tick

SMEs can have a huge impact on the world standing of European research. Just look at the work of IMS Nanofabrication AG, a brilliant star in the semiconductor constellation. And Europe's research funding programme has helped this tiny company shine all the more brightly.

The semiconductor industry is the clock that beats the rhythms of the Information Age. Its revolutions are marked in 18-month cycles and its ticks herald great advances in IT.

We know that it works to an 18-month cycle, thanks to Gordon Moore, co-founder of Intel and his Moore's Law which states that the number of transistors on a microchip will double every 18 months for the same cost. As the silicon clock makes its 18-month revolutions, the technology's power increases as its size and cost diminishes.

There are theoretical limits, like the possible size of printed circuits using various light frequencies, atomic force telescopes and electron beams. All technologies eventually reach a point where physical laws — like the speed of light or the frequency of an electromagnetic wave — stop one particular line of innovation. But within the boundary of physics, researchers always find ways to work around the problem. And in Europe, SMEs are often in the thick of it.

European SMEs are a vital part of the innovation economy. They are smaller and far more numerous than their American counterparts, according to the Hitech Federation, an association for technology SMEs in Europe. The average staff level of a European SME is just 6, against 19 in the United States. But European SMEs account for a staggering 34 % of employment across the continent, while in the United States the sector accounts for just 11 % of total employment.

One company, IMS Nanofabrication AG in Vienna, Austria, is a simple example of just how big a role SMEs can play on the world stage. The company designed a solution which could dramatically shave chip-making production time and cost, called 'Projection mask-less lithography' (PML2).

Masks in lithography are expensive and time-consuming to produce and one leading chip needs several of such critical masks to complete the circuit. Industry needs a cost-effective and fast system now, according to Dr Hans Loeschner, cofounder and Chief Technical Officer (CTO) at IMS Nanofabrication. A system that can produce chips for low-volume applications, for developing new devices and rapid prototyping.

IMS Nanofabrication's solution does not use a single electron beam direct write device, usually

used for making masks and writing on wafers with very low throughput. Instead, they split the electron beam into thousands of smaller, micrometer-sized beams via an aperture plate. Those beams then pass through a blanking plate, which deflects some of the smaller beams. The un-deflected beams imprint the desired pattern on the silicon wafer.

The idea has been around since the 1980s, but it was not possible to fabricate the blanking device at that time. 'There was a further problem to realise a demagnification of 200:1 to turn micrometer-sized beams into beams of less than 20 nm in sharpness,' says Dr Loeschner. Now IMS Nanofabrication can provide the required degree of sharpness. It was an exciting and promising idea, but going from a theoretical concept to a practical prototype was a big leap.

And here is another even more important lesson that IMS Nanofabrication can teach us: the importance of research support to European SMEs. The company had a great idea, but needed help turning it into a proof-of-concept system.

Enter Europe's IST research funding programme (FP6), which provided a grant that allowed IMS and its partners to create the Rimana project. IMS Nanofabrication and Rimana were able to build and test a new device for semiconductor lithography that could unlock a major bottleneck in microchip design.

It has had a huge impact, with Rimana invited all over the world to talk about its work. The project immediately seized the interest of global players on the semiconductor stage, and it is in advanced negotiations with a strategic partner to commercialise its prototype PML2 device.

It has only begun to explore the potential of the new technology, which could have a long life. So much so that PML2 is now part of a larger research consortium called MAGIC, to further refine the concept.

So how did an SME in Austria become a player in the global semiconductor stage? 'There were a variety of factors that played an important role,' Dr Loeschner tells ICT Results. 'Excellent person-

nel and management were key elements. Gerhard Gross, our CEO, was Sematech Director of Lithography and headed a company that produces electron beam systems.

'He stimulated mask-less lithography development and that helped to get our idea PML2 known. Elmar Platzgummer, our COO, is a young, most innovative physicist. Together with him the "radical innovation" [in] PML2 was developed. But you have to choose the right forum,' Dr Loeschner warns.

He says creating a good abstract was essential to get the opportunity to present the idea, and then it is vital to make a really compelling presentation spelling out the benefits clearly. 'Christof Klein, our PML2 Project Manager, was able to fulfil this task,' Dr Loeschner notes.

'We were very lucky as well in that we had an excellent project officer, who really understood the technology and was able to offer great feedback and a critical appraisal of the work we were doing, what was working and what was not. [Our] European Commission project officer was really an excellent resource and he helped the project immensely.'

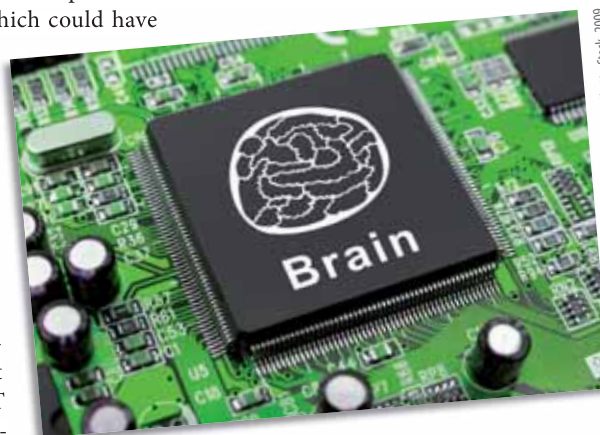
Dr Loeschner added that it was critical to have an inventive spirit, to overcome problems that might occur during the R & D of a new idea. Good connections and contacts within the industry were important, too.

It is a tall order for an SME, but the rewards are worth the effort. IMS Nanofabrication has developed a bottleneck-breaking technology that could change the rules of the game in the semiconductor world. All of which points to perhaps the most important lesson. In Europe, SMEs really are the ticks on the semiconductor clock.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90230>

See also page 45 (Unmasking a faster solution for chip-making)



Micromechanical influences on sintering green parts

High-temperature sintering during the manufacture of metal powder metal alloys enhances the functional properties of automotive parts, including strength and corrosion resistance. On the other hand, accurate computer simulations of deformation during sintering could reduce the wastage of raw materials and furthermore, the overall manufacturing costs.

The current trend in material processing is to develop manufacturing methods for near-net shape products. Among the environmentally acceptable processing technologies, powder metallurgy is considered the most promising for realising the full economic potential of near-net shape forging of complex automotive parts.

The PM-MACH project has developed effective techniques for compacting metal powders when placed in a closed metal cavity under pressure. Powder compacts, which are referred to as 'green' parts, are

then heated in a protective atmosphere at a high temperature to form a solid close to the desirable shape.

To improve the accuracy in the powder compacts' dimensions and minimise the secondary finishing operations, project partners at the Institut National Polytechnique de Grenoble used finite element (FE) simulations. In combination with appropriate material constitutive laws, they were able to describe the evolution of the microstructural characteristics, including the size distribution of powder particles as well as

of pores. Moreover, the final shape could be predicted and the mechanical properties characterised more accurately than ever thought possible.

More specifically, the green parts' deformation during sintering is highly anisotropic as a result of the inhomogeneous internal structure. For this purpose, an anisotropic constitutive equation was formulated on the basis of information obtained by dilatometry and X-ray absorption micro-tomography, among other techniques. Containing several material parameters that need to be estimated from experimental data, it is yet simple enough to be implemented in any finite element simulation code.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4466

Welcoming a greener urban vehicle

A novel small vehicle promoting cleaner urban transport while lessening traffic and parking congestion has been designed.

The rise in mobility in every day life has a negative impact on the environment. This has brought on a quest for vehicle ingenuity with greener technology. In light of this, the Clever project has designed a small vehicle for clean urban transport with minimum requirements on urban space in traffic as well as in parking. In addition, a new storage and refuelling technology is part of this endeavour, promoting the use

of alternative energies for vehicle operation in which refuelling could take place at home.

Thus, it is no surprise that the Clever vehicle has market potential particularly in the cities of Thessaloniki, Greece and Graz, Austria. Part of the vehicle's appeal is that it merges the benefits of a car without the worry of congestion and parking problems.

Residents who are likely to switch modes of transport are both car drivers as well as those who use public transport. The most significant benefit of the Clever vehicle is its potential to reduce gas emissions and fuel consumption making it very appealing to policy makers and transport experts alike.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4505

Improved coating deposition for better turbine blades

High-performance turbine blades, such as those found in the engines of aeroplanes, need to have high-performance coatings that provide resistance to oxidation. To develop such coatings, an EU-funded project, Ordico, developed an innovative means of co-deposition of hafnium-enriched aluminium diffusion layers on super alloys.

Scientists adopted the fluoride route during chemical vapour deposition (CVD) to generate a vapour phase with metal halide precursors. The evaporation temperature of the fluorides establishes the partial pressure of the hafnium (Hf) and its content at the diffusion layer. This ensures diffusion layers of up to 30 micrometres thick and 1 % Hf is obtained.

Unfortunately, the process could not resolve the inhomogeneous perpendicular distribution problem, requiring that either an annealing technique or an improved precursor feed would need to be developed.

However, the process is successful in that it presents a means by which turbine blades can be improved in regards to the environment. Part of the project's goals was to develop these techniques in a manner that would reduce the industry's impact on the environment as well as provide cheaper alternative processes.

Overall, improving the oxidation resistance of super alloy blades also has an inherent advantage of allowing these blades to perform at higher temperatures. This provides more efficient fuel consumption. Additionally, these coated blades extend the main-

tenance requirement intervals. The coating process has increased oxidation resistance by fourfold, a substantial improvement.

Since fatigue is largely promoted through oxidation, this process advances the lifespan of turbine blades, hence reducing associated costs with maintenance and replacement.

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

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

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Applying science to the decorative arts

Iznik and Majolica ceramics are held up as examples of the most important categories of all the Mediterranean ceramic styles. The Ceramed project examined these historical artefacts in depth, aiming to improve on specific processes involved in their creation. Specifically, researchers sought to offer alternatives to the glazing substances used.

Pottery and ceramics have a long history and many exquisite pieces are considered national treasures because of the immense skill applied to make them. Iznik pottery describes the highly decorative ceramics made in the late 16th century and can be seen in imperial buildings in Istanbul. It harks back to a time when Chinese ceramics were admired and emulated in the Islamic world. The Majolica ceramic traditions follow a similar style but were produced in Renaissance Italy. This craft was practiced in Italy for hundreds of years and came to take on the sophistication and artistry on a par with the making of fine jewellery.

The Ceramed project turned its attention to the raw materials used in ancient ceramic production and tried to test these through actual experimental reproduction to the benefit of both archaeometry and ethnoarchaeology. The results led to the development of a 'museum quality' label based on technological and archaeological criteria. Overall, the aim was to revitalise the high-quality ceramic artefact sector for the museum market.

As part of this initiative the scientists reproduced the glazing process in ceramic production. The production of the low-fired decora-

tive ware almost always involved it being glazed with tin oxide. Once the colorant was added to the glaze, it enabled it to cover even terracotta clay. The glaze gave depth to the surface, as well as providing a functional durability.

In response to today's health concerns regarding the use of lead in ceramics, scientists developed and evaluated lead-safe and free formulations suitable for glazing. Lead-safe silicates were amongst the alternatives, which were tested for their optical properties and interactions with quartz-based substrates. Furthermore, spectroscopic tools were developed for the evaluation of lead-safe and lead-free formulations.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4483

New direction for old sludge treatments

Fresh European directives are bringing new insights on the treatment of sewage sludge. The development and reforming of directives on sludge treatment has pressurised research into developing a new understanding and need for reference materials.

Driven by changing attitudes in wastewater sludge treatment and higher standards of safety and hygiene, an EU-funded project, Sludgesupport, has set about investigating sludge material and its potential treatments. This was done in order to develop reference materials at a laboratory scale acceptable throughout the EU. Its aim is to improve and/or maintain the quality levels, assurances and accreditation for treatment processes, materials and their further use or disposal.

The targeted sludge samples were taken from state-of-the-art treatment facilities,

and identified based on the levels of contaminants in the sludge samples. The project sought to look at technical aspects of treatment, the methodologies and processes needed, as well as an assessment on commercial potential based on the final product.

A number of processes were investigated such as freeze drying, sterilisation, irradiation using cobalt-60 (Co-60) and a further cryo-milling cooling with liquid nitrogen. The specific enterprise aimed at processing 60 kg of raw sewage sludge with the inten-

tion of removing contaminants, stench and potentially contagious materials. The resulting material had to fill 500 bottles with ready-to-use reference material.

Not covered yet, but probably the focus of future study, are the homogeneity, stability and test certification studies. It is intended that the technical achievements of the study will be made available to a wide range of scientific bodies and audiences, with the intention of being published in peer reviewed journals and reports.

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

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4387

Ceramic art not just for tourists

The Ceramed project focused on archaeology, art and conservation. It took a group of traditional potters, who were used to producing art for the tourist market, and train them so that they could produce high-quality, technologically authentic reproductions of ceramic art.

A walk down any of the main tourist streets in Athens involves browsing at the little shops and stalls adorned with ceramic sculptures, lamps and bowls, recreated for tourists in the style of those artefacts from everyday life of classical Athens.

The Ceramed project, an EU-funded initiative, gave support to the improvement of ancient Mediterranean ceramic artefacts. Consortium partners collaborated with traditional potters, vase painters and other artists to establish a pool of skilled people

who reproduced various types of unglazed ceramic ware.

The aim was to lead their skills away from the tourist scene and appropriate them to the demands of reproducing a high-quality object for the museum market.

This involved the artists taking part in various seminars which were tailored to the examination and analysis of archaeological artefacts. The Greek Ministry of Culture, the Benaki Museum, the Museum of Cycladic

Art and the Getty Museum all played their part in this collaborative effort.

The result included the creation of new objects inspired by ancient Athenians' daily life. All ceramic products are handmade and decorated with clay slips. These acquired their colour during the firing process in contrast to the usual tourist market products decorated after firing with 'cold' acrylic paints. The artefacts were destined for museum shops, special exhibitions, private collections and educational projects.

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

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

<http://cordis.europa.eu/marketplace> > search > offers > 4522

Machining titanium alloys

Research undertaken within the EU-funded Dutifrisk project has improved knowledge in the combination of materials that can be used in the high-precision machining of aero-engine components.

There are probably no other materials more appropriate for high-performance aero-engine applications than titanium and its

alloys. With a density of 4.5 g/cm³, titanium alloys are only half as heavy as steel or nickel-based superalloys and furthermore, they are characterised by superior strength-to-weight ratio.

With the completion of Dutifrisk, engineers' efforts to advance the state of the art in the design of gas turbine components have achieved a milestone. In a conventional turbine compressor, blades are manufactured separately from the disc, and then mechanically assembled together.

Led by MTU Aero Engines, the Dutifrisk project partners explored an alternative scenario in which the blades and the disc form a single component without discontinuities. During the linear friction welding process, the blade is fretted against the disc, and a load is applied normal to the junction until a joint is developed.

The ultimate aim was to identify optimised machine param-

eters for the production of linear friction welded bladed discs (blisks) with discs made from β -forged Ti6246. The attached blades were made from α/β -forged Ti64, Ti6246 and Ti6242 with different microstructure to the discs.

Besides other attractive mechanical properties, forgings of high-strength metastable β -Ti alloys ensured a low level of residual stresses after machining. More specifically, the influence of microstructure and stress effects on the fatigue performance of titanium alloys was evaluated with the use of an advanced process simulation system.

Based on the finite element method (FEM), Deform-2D allowed a detailed analysis as well as the realistic modelling of the complex metal forming process on the computer. Valuable information on key physical parameters was then compared and found to be in accordance with residual stress measurements collected during extrusion trials.

The accurate characterisation of all welded materials' combinations for the disc and blades may offer the possibility of choice for intelligent design in the future.

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

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4529



Reassuring safety through research

Due to the need for absolute reliability of each system during nuclear power plant operation, defining the location of potential faults in individual system components is of principal interest.

Properties of non-replaceable component materials, such as pressure vessels, may change considerably during the lifetime of a nuclear power plant. For example, embrittlement is a phenomenon whereby the material toughness is lowered by the effect of radiation exposure or due to accidental lowering of temperatures. Hence the structural integrity analyses of the reactor power vessel need to be updated from time to time with information on fracture toughness or faults in the structure.

During FP5, the FRAME project was supported by the AMES network to research into irradiation embrittlement, which is currently estimated from Charpy-V impact test data. As Charpy-V impact toughness is in many respects a different material property than fracture toughness, scientists' understanding of embrittlement may have been a biased one up until now.

FRAME was primarily an experimental project, where fracture toughness tran-

sition temperature was measured under unirradiated and irradiated conditions for different materials, including steel. Furthermore, trend curves were derived by in essence mathematically fitting candidate functions to the measured fracture toughness data. These provided a description of the embrittlement response in terms of material chemistry and neutron fluence, which could be compared with published models based on Charpy-V test data.

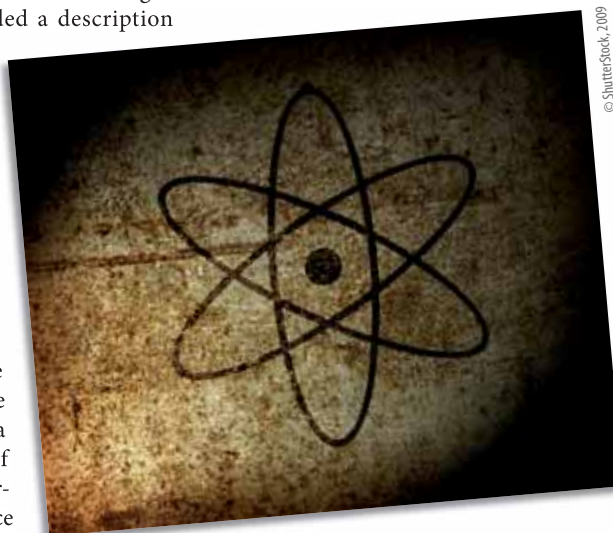
Fracture toughness-based trend curves were not available before the FRAME project, because of the insufficient size of the experimental data required. If variation of material chemistry inherent in the large surveillance

database could be minimised, the establishment of even more generic trend curves was proven to be feasible.

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

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

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Photonics emerges from the shadows

The name has been around for four decades, but only now is a recognisable photonics community emerging in Europe. A European study has documented a fast-growing sector of more than 2 100 companies and 700 research laboratories.

In 2005, Europe's photonics sector earned EUR 43.5 billion and was growing at 12 % a year. It employed 246 000 people, accounted for 19 % of world production and was already bigger than the semiconductor sector. Yet, at the same time, the industry was hardly recognised in Europe.

So what is photonics? As a scientific discipline it includes everything to do with the manipulation of photons, the particles of light. The term was coined in 1967 but its wide-ranging and interdisciplinary nature means that photonics is only recently becoming recognised as a distinct sector of industry.

And before the EU-funded Opera2015 project was launched in 2005 to take stock of this nascent industrial sector no one really knew the extent of Europe's activities in photonics.

'When we started about three years ago, there was no photonics community existing in Europe,' says Markus Wilkens, the project coordinator. 'Photonics itself was rather fragmented and still is. Because photonics is a horizontal technology you will find it in many different fields like defence, or manufacturing or healthcare.'

Indeed, a recent report identified the photonics industry as encompassing 10 subsectors, including production technology, optical measurement and machine vision, medical technology and life sciences, optical communications, information technology, lighting, flat panel displays, solar energy, defence photonics, and optical systems and components. So broad is the sector that many businesses have been working in photonics without recognising their shared interests.

It is precisely this fragmentation which has delayed the emergence of photonics as a

recognised industrial sector and hampered its ability to pursue a coherent programme of development. 'So far, only Germany, and to some extent the United Kingdom and France, have dedicated funding programmes in the field of photonics,' Wilkens notes. 'The aim of Opera2015 was to compile as much information as possible at a European scale to make the industrial research landscape more visible.'

One of the project partners, TNO in the Netherlands, compiled a database of more than 2 100 photonics companies in the EU and candidate and associated countries. Another partner, Opticsvalley in France, identified over 700 institutes and laboratories specialising in photonics. On top of this, the project found about 50 clusters devoted to photonics around Europe.

This is the first time such an inventory has been published. It reveals that Germany, France and the United Kingdom are the leading players in Europe's photonics sector, followed by Italy and the Netherlands. The database is freely available from the Opera2015 website along with other resources compiled during the project. The numbers are likely to be underestimated. Industry sources believe that there may be more than 5 000 photonics companies manufacturing in Europe, most of them SMEs.

The project finished in April 2008 with a summit meeting at the 'Photonics Europe' congress in Strasbourg, France. Opera2015 worked closely with another EU initiative known as Photonics21, one of a series of European technology platforms (ETPs) established to define priorities for research, technology and development in strategically important industrial sectors. Indeed, Wilkens' company,



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VDI Technologiezentrum in Düsseldorf, also hosts the Photonics21 secretariat.

'Opera2015 was more about collecting information and the aim of Photonics21 is to agree on common strategic research priorities for Europe,' he explains. 'But of course, the overall aim is to support the establishment of a photonics community in Europe, agree on a common research strategy and then implement the strategy. So you need information, for instance, on how many companies and research institutes are present in Europe, and what they are doing? All this wasn't known before.'

The figures reveal that Europe is strong in production technology, in optical components and systems, in medical technology and life sciences and also in lighting. But some sectors, like flat panel displays, are dominated by Asian firms, except for some niche applications.

Now that Opera2015 has completed its work, the database has been taken over by Photonics21 which is using information gathered during the project to steer its strategic research agenda for Europe.

'The aim of Opera2015, shared with Photonics21, was to make people aware that photonics should be regarded as a known discipline both in scientific research and also in industry,' Wilkens says.

The good thing for the European Commission, he suggests, is that it no longer has to listen to 30 different representatives from 20 countries and different associations. Now the photonics community speaks with one voice.

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<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90151>



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Unmasking a faster solution for chip-making

European researchers have developed a promising solution to mask-less semiconductor lithography and generated intense interest among major industry players.

Mask-less lithography (ML2) promises to rapidly reduce the costs and production times associated with low-volume device manufacture and prototyping. A mask is a type of template that allows semiconductor manufacturers to print the circuit design onto a silicon wafer for microchip production. But masks are very expensive and several are needed for one chip.

'The cost of masks is also rising as chip features become smaller and more sophisticated,' explains Dr Hans Loeschner, administrator of the Rimana project.

The project was set up to demonstrate the feasibility of a new technique for mask-less lithography, called 'Projection mask-less lithography' (PML2). It uses a variety of technologies in combination to burn a chip without a mask.

Rimana's work has been wildly successful. The technology is now part of another EU-funded project, MAGIC, that will refine PML2 and examine alternatives, even though Rimana will only finish its work in autumn 2008.

Better yet, the industry is already intensely interested in the work currently in completion. Rimana's lead partner, IMS Nanofabrication, is in advanced talks with a leading industry player to develop the current prototype into a commercial model, possibly as early as 2011.

Leading industry figures like Dr Burn Lin, senior director of the lithography division of the Taiwan Semiconductor Manufacturing Company (TSMC), the leading semiconductor foundry in the world, believe that platforms like the Rimana PML2 technology could have a very long life.

Further development on the Rimana concept, Dr Lin believes, could push the technology to respond to even greater challenges in the semiconductor lithography space. Semiconductor lithography is essentially printing for microchips. The chips are printed with the tiny channels, gates and transistors that make up modern integrated circuits (ICs).

'Just like the printing industry, you have different printing machines for different purposes. A newspaper would have an enormous printer installation, that would be like Intel or AMD producing microprocessor chips or Micron and Samsung printing memory chips, but other solutions are needed for small print-runs and one-off projects,' explains Dr Loeschner.

As semiconductors for all applications become more sophisticated, current solutions to the problem are no longer adequate to meet demand. 'The industry needs a cost effective and fast system, and now. There is already demand for a system that can produce chips for low-volume applications, for device development and for rapid prototyping,' Dr Loeschner reveals.

The EU-funded Rimana project looked at a combination of established technologies for a radical potential solution. 'The idea behind PML2 has been around for a long time, a similar system was proposed already in the 1980s, but there were problems that were impossible to solve at the time,' Dr Loeschner states.

Rimana's solution does not use a single electron beam direct write unit, which is normally used to make masks. Instead, the PML2 technology uses an electron beam



that is directed to an aperture plate system that splits the beam into many thousands of smaller beams. Next, a blanking plate may deflect individual beams. Only the un-deflected beams are projected to the silicon wafer surface to create a pattern, and that pattern is needed for the circuit fabrication.

But that simple explanation overlooks a large number of major innovations. For example, the company found a way to reduce by 200 the small beams produced by the aperture. 'A 25 mm diameter electron beam could be split into many hundred thousand micrometer-sized beams, and we then reduce those beams down to less than 20 nm,' explains Dr Loeschner.

Rimana tested its technology on 32 nm and 22 nm half-pitch (hp) circuit patterns. Half-pitch refers to a measure of lines and spaces to separate it from other elements within the circuit. A smallest resolution of just 16 nm hp was achieved, surpassing the 22 nm hp target of the Rimana project.

Now, lead partner IMS Nanofabrication, together with the Rimana partners, is putting the finishing touches to a programmable blanking plate. This uses an integrated complementary metal oxide semiconductor (CMOS) electronics to control beam deflection and is a major advance for the technology because it means that the patterns created by the PML2 system can be changed quickly.

All in all, it is a very complete, functioning proof-of-concept system. Within the MAGIC project, a pre-commercialisation model is being realised in 2008 followed, in 2009, by a PML2 alpha tool. Work remains to be done to make the system more robust, but it could be available commercially very soon.

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See also page 40 (SMEs make Europe's innovation clock tick)



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>

Workshop on drug resistance in ovarian cancer

A workshop entitled 'Drug resistance in ovarian cancer: biomarkers and treatments' will take place from 19 to 20 February 2009 in Modena, Italy.

Ovarian cancer is the fifth most common cause of death from cancer, and the most common cause of death from gynaecologic cancer in women of all ages in the Western world. Efforts to improve survival continue to focus on the development of more effective systemic therapies, identification of biomarkers for early diagnosis, improving drug efficacy and countering drug resistance. New and higher-quality therapies are on the horizon. However, research efforts in the field are fragmented and require better coordination.

The workshop is intended to highlight the need to establish links between the different disciplines pursuing the common aim of identifying a compact strategy to combat ovarian cancer.

The event is organised by two EU-funded projects focused on ovarian cancer, 'Ligands to interfere with human thymidylate synthase' (Lights) and 'Ovarian cancer — diagnosing a silent killer' (OVCAD).

For further information, please visit:
<http://www.ovariancancer.unimore.it>

Course on ceramic nanocomposites-based products

The EU-funded 'IP Nanoker' project is offering a training course on the production of ceramic nanocomposites-based products in Madrid, Spain, from 23 to 27 February 2009.

In five modules, the course will cover the following topics:

- materials, process and product development strategy;
- the synthesis of nanopowders;
- the processing of nanocomposites;
- properties of nanocomposites;
- modelling and simulation.

The course is aimed at young researchers, engineers and professionals from the EU Member States. It is particularly interesting for those with a degree in chemistry, physics, metallurgy or materials science, and who are interested in acquiring specialised training in the development of nanostructured materials with applications in the fields of biomedicine, optics and materials for use in extreme conditions.

For further information, please visit:
http://www.nanoker-society.org/index.aspx?id_page=387

Conference on graphene science

The European Science Foundation (ESF), the Austrian Science Fund (FWF) and the University of Innsbruck, Austria, are jointly organising a conference on graphene science, entitled 'Graphene week', from 2 to 7 March 2009 in Obergurgl, Austria.

The conference will be entirely devoted to the rapidly progressing science and technology of atomically thin graphitic films, or graphene, including advances in the growth and manufacturing of graphene-based devices, the investigation of physical properties of graphene using a broad range of characterisation methods, and emerging applications of this new material.

Topical sessions will address:

- graphene synthesis and its study;
- manufacturing of graphene p-n junctions, nanoribbons and quantum dots and their transport studies, heat transfer in graphene-based structures and hybrid circuits;
- optical properties of graphene and its applications in optoelectronics.

The conference is intended for researchers working on graphitic systems, or simply interested in learning more about graphene.

For further information, please visit:
<http://www.esf.org/activities/esf-conferences/details/2009/confdetail262.html?conf=262&year=2009>

Conference on the importance of research and technology to business

The Engineering and Physical Sciences Research Council (EPSRC) is organising the conference 'Pioneers 09' on 4 March 2009 in London, United Kingdom.

Composed of seminars, keynote talks and an exhibition, Pioneers 09 will focus on the importance of research and technology to business. The occasion is intended as a brokerage event for business and industry to connect with the world of academia and to find out about funding opportunities.

Plenary sessions and parallel seminars will cover the following areas:

- the impact of pioneering research on society and business;
- opportunities for small businesses in working with universities;
- how to build partnerships between business, government and universities;
- training scientists and engineers to tackle the challenges of the 21st century;
- privacy in the digital world.

For further information, please visit:
<http://pioneers.eprsc.ac.uk>

Conference on animal welfare

The EU-funded 'Welfare quality' project will hold a scientific conference entitled 'Knowing animals: a cross-fertilisation between natural and social sciences for understanding the quality of life of animals' in Florence, Italy, on 5 and 6 March 2009.

The meeting will look at animal farming and how the lives of animals kept for food production are studied and represented. In a combination of plenary sessions, keynote speeches and parallel workshops, the conference will address five broad themes:

- naturality: 'cowness, pigness, chickenness';
- designing for welfare;
- zoomorphisms and anthropomorphisms;
- standards as a mode of animal welfare governance;
- animal welfare and food quality.

The two-day discussion of these five specific themes is intended to promote dialogue and cross-fertilisation of ideas and perspectives between animal scientists and social scientists, reflection upon the practices of knowledge production and the understanding of animals, as well as the animals' quality of life that such practices generate.

For further information, please visit:
<http://www.knowinganimals.org>

School on hybrid nanostructured materials

An advanced school on hybrid nanostructured materials for photovoltaic applications will be held from 9 to 11 March 2009 in Valencia, Spain.

The school is intended for PhD students, post-doc and junior faculty members who are currently interested in the field of hybrid nanostructured materials for photovoltaic (PV) applications. Lectures and seminars will cover recent advances in the area and the following subjects:

- introduction to solar energy and solar cells;
- introduction to hybrid solar cells;
- growth of nanostructures for PV;
- surface modification processes;
- organic dyes optimisation;
- optical characterisation of hybrid systems;
- theory of electron transfer in organic/inorganic systems;
- transport in nanostructures;
- solar cell characterisation.

The event is organised as part of the European NanoLICHT project funded by the European Research Area Network (ERA-Net) NanoSCI-ERA.

For further information, please visit:
<http://www.nanolicht.polito.it/school2009.html>

Scientific congress on climate change

The University of Copenhagen will host an international scientific congress on climate change under the heading 'Climate change: global risks, challenges and decisions' from 10 to 12 March 2009 in Copenhagen, Denmark. The event is organised in cooperation with nine other universities in the International Alliance of Research Universities (IARU).

The main aim of the congress is to provide a synthesis of existing and emerging scientific knowledge necessary in order to make intelligent societal decisions concerning mitigation and adaptation strategies in response to climate change. The event is set to identify the advances in science, technology and policy required that will ensure the sustainability of global communities in the current and coming decades.

The congress takes place in the run-up to the United Nations (UN) Climate Change Conference (COP15) in Copenhagen at the end of 2009. All findings will be compiled in a book on climate change, and an executive summary with the main findings will be given to policy makers at the COP15, complementing the work of the UN's Intergovernmental Panel on Climate Change (IPCC).

For further information, please visit:
<http://climatecongress.ku.dk>

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 numerus clausus 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

Conference on biomass

The '17th European biomass conference and exhibition — from research to industry and markets', will take place from 29 June to 3 July 2009 in Hamburg, Germany.

The conference is committed towards gathering the best expertise to discuss and analyse the present and future dynamics of the global biomass sector. This international conference is aimed at stimulating public discussion and promoting awareness of the biomass community.

Scientists, industry, suppliers, funding bodies and decision-makers are invited to meet the more than 1 500 expected attendees.

For further information, please visit:
<http://www.conference-biomass.com>

Conference on gender and diversity in science, technology and business

The conference entitled 'Going diverse: innovative answers to future challenges' is organised in the context of the EU-funded TANDEMplusIDEA project. It will take place from 29 to 30 October 2009 in Aachen, Germany.

All interested experts from academia, the corporate world and non-governmental organisations are invited to contribute to this conference. They may do so by submitting proposals on the themes of the conference indicating their track of choice, the title of their proposal, a summary of their presentation and their contact data. Deadline for submitting proposals is 28 February 2009.

The event will give experts a platform to discuss gender and diversity in science, technology and business. It will present studies, concepts and practical experiences from various areas, examine best practice examples and identify important fields of action.

For further information, please visit:
<http://www.idealeague.org/tandemplus/conference>

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